OPERATION AND PARTS MANUAL

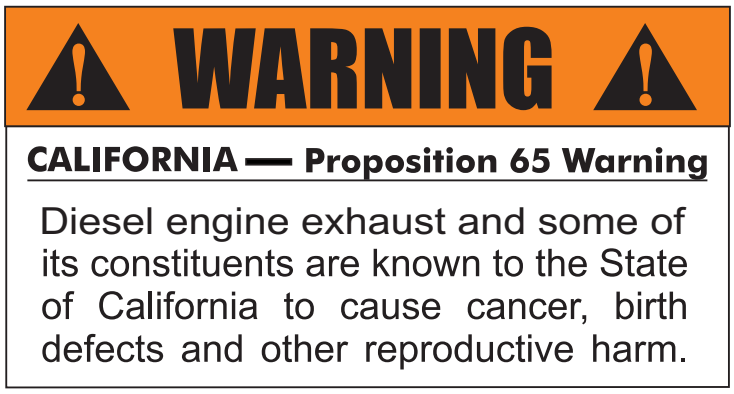
MULTIQUIP

MAYCO SERIES
MODEL LS600
CONCRETE PUMP
(DEUTZ BF4L914 DIESEL ENGINE)

Revision #4 (09/15/11)

To find the latest revision of this publication, visit our website at: www.multiquip.com

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.


WARNING
CALIFORNIA — Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

NOTES

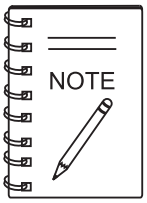
MAYCO LS600 CONCRETE PUMP

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Specification and part number are subject to change without notice.

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Note: Discounts Are Subject To Change

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Note: Discounts Are Subject To Change

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Non-Dealer Customers:
Contact your local Multiquip Dealer for parts or call 800-427-1244 for help in locating a dealer near you.

International Customers should contact their local Multiquip Representatives for Parts Ordering information.

When ordering parts, please supply:

- ❒ **Dealer Account Number**
- ❒ **Dealer Name and Address**
- ❒ **Shipping Address (if different than billing address)**
- ❒ **Return Fax Number**
- ❒ **Applicable Model Number**
- ❒ **Quantity, Part Number and Description of Each Part**

❒ **Specify Preferred Method of Shipment:**

✓ UPS/Fed Ex
- Priority One
- Ground
- Next Day
- Second/Third Day

✓ DHL
✓ Truck

NOTICE

All orders are treated as *Standard Orders* and will ship the same day if received prior to 3PM PST.

WE ACCEPT ALL MAJOR CREDIT CARDS!

LS600 PUMP — SAFETY MESSAGE ALERT SYMBOLS

FOR YOUR SAFETY AND THE SAFETY OF OTHERS!

Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the Safety Messages and Operating Instructions could result in injury to yourself and others.



This Owner's Manual has been developed to provide complete instructions for the safe and efficient operation of the **Multiquip Mayco *LS600 Concrete*** pump. Refer to the engine manufacturers instructions for data relative to its safe operation.

Before using this pump , ensure that the operating individual has read and understands all instructions in this manual.

SAFETY MESSAGE ALERT SYMBOLS

The three (3) Safety Messages shown below will inform you about potential hazards that could injure you or others. The Safety Messages specifically address the level of exposure to the operator, and are preceded by one of three words: **DANGER**, WARNING, or CAUTION.

DANGER

You **WILL** be **KILLED** or **SERIOUSLY** injured if you do not follow directions.

WARNING

You **COULD** be **KILLED** or **SERIOUSLY** injured if you do not follow directions.

CAUTION

You **CAN** be injured if you do not follow directions

HAZARD SYMBOLS

Potential hazards associated with operation of the pump will be referenced with Hazard Symbols which appear throughout this manual, and will be referenced in conjunction with Safety Message Alert Symbols. Some examples are listed below:

WARNING - LETHAL EXHAUST GASES



Diesel engine exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled. **NEVER** operate this equipment in a confined area or enclosed structure that does not provide ample free flow air.

WARNING - EXPLOSIVE FUEL



Diesel fuel is extremely flammable, and its vapors can cause an explosion if ignited. **DO NOT** start the engine near spilled fuel or combustible fluids. **DO NOT** fill the fuel tank while the engine is running or hot.

DO NOT overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system. Store fuel in approved containers, in well-ventilated areas and away from sparks and flames. **NEVER** use fuel as a cleaning agent.

WARNING - BURN HAZARDS



Engine components can generate extreme heat. To prevent burns, **DO NOT** touch these areas while the engine is running or immediately after operations. **NEVER** operate the engine with heat shields or heat guards removed.

LS600 PUMP — SAFETY MESSAGE ALERT SYMBOLS

WARNING - ROTATING PARTS



NEVER operate equipment with covers, or guards removed. Keep ***fingers***, ***hands***, ***hair*** and clothing away from all moving parts to prevent injury.

CAUTION - ACCIDENTAL STARTING

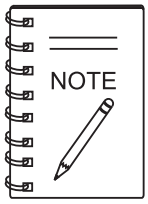


ALWAYS place the **Engine ON/OFF** switch in the **OFF** position. **NEVER** perform maintenance on the unit with the ignition key in the **ON** position.

CAUTION - OVER-SPEED CONDITIONS



NEVER tamper with the factory settings of the engine governor or settings. Personal injury and damage to the engine or equipment can result if operating in speed ranges above maximum allowable.



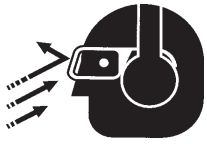
This ***pump***, other property, or the surrounding environment could be damaged if you do not follow instructions.

CAUTION - RESPIRATORY HAZARDS



ALWAYS wear approved ***respiratory*** protection.

CAUTION - SIGHT AND HEARING HAZARDS



This machine is capable of producing noise levels above 85 dB. Hearing protection is required. **Always** wear eye protection.

CAUTION - EQUIPMENT DAMAGE MESSAGES

Other important messages are provided throughout this manual to help prevent damage to your concrete pump, other property, or the surrounding environment.

⚠ DANGER - READ OPERATION AND PARTS

Failure to follow instructions in this manual may lead to serious injury or even ***death!*** This equipment is to be operated by trained and qualified personnel only! This equipment is for industrial use only.

The following safety guidelines should always be used when operating the LS600 concrete pump:

GENERAL SAFETY

- **DO NOT** operate or service this equipment before reading this entire manual.



- This equipment should not be operated by persons under 18 years of age.
- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, steel-toed boots and other protective devices required by the job.

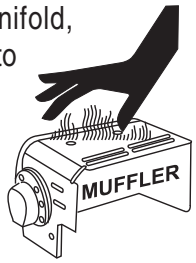


- **NEVER** operate this equipment when not feeling well due to fatigue, illness or taking medicine.

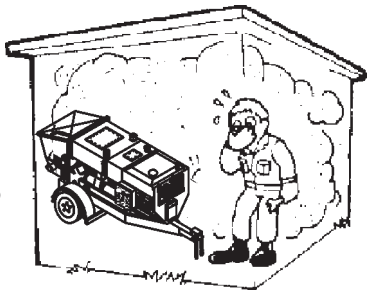




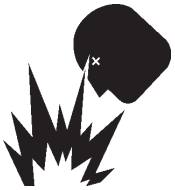
- **NEVER** operate this equipment under the influence or drugs or alcohol.
- **ALWAYS** check the machine for loosened threads or bolts before starting.
- **ALWAYS** wear proper **respiratory** (mask), ***hearing*** and ***eye*** protection equipment when operating the pump.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacture does not assume responsibility for any accident due to equipment modifications.
- **NEVER** use accessories or attachments, which are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to user may result.
- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing engine or pump.



- **High Temperatures** – Allow the engine to cool before adding fuel or performing service and maintenance functions. Contact with ***hot!*** components can cause serious burns.



- The engine section of this pump requires an adequate free flow of cooling air. ***NEVER*** operate the pump in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause serious damage to the pump or engine and may cause injury to people. Remember the pump's engine gives off ***DEADLY*** carbon monoxide gas.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids. When refueling, **stop the** engine and allow it to cool.



- **NEVER** ***smoke*** around or near the machine. Fire or explosion could result from ***fuel vapors***, or if fuel is spilled on a ***hot!*** engine.



- **NEVER** operate the pump in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe ***bodily harm or even death***.
- Topping-off to filler port is dangerous, as it tends to spill fuel.
- **ALWAYS** remove the ***ignition key*** when leaving the pump unattended.
- **ALWAYS block** the ***wheels*** on the unit when using on a slope.
- **ALWAYS** maintain this equipment in a safe operating condition at all times.
- **ALWAYS** stop the engine before servicing, adding fuel or oil.

- **NEVER** run engine without air filter. Severe engine damage may occur.
- **ALWAYS** be sure the operator is familiar with proper safety precautions and operation techniques before using pump.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children.
- **DO NOT** operate this equipment unless the hopper grate, guards and safety devices are attached and in place.
- **CAUTION** must be exercised while servicing this equipment. Rotating and moving parts can cause injury if contacted.
- Keep all ***inexperienced*** and ***unauthorized*** people away from the equipment at all times.
- Before start-up, check the hopper and remove all foreign matter and debris.
- **DO NOT** use worn or damaged hose couplings, inspect all hoses and couplings for wear. Replace any worn or defective hose or couplings immediately.
- Keep hands out of the hopper when the engine is running.
- **DO NOT** disconnect hose couplings or nozzle while under pressure. Relieve pressure by activating the reverse function switch located on the control panel.
- Unauthorized equipment modifications will void all warranties.
- Check all fasteners periodically for tightness. Also check towing tongue bolt, lock nut and wheel lug nuts for wear.
- Test the ***pump's ON/OFF*** switch. The purpose of this test is to shut down the engine.
- Refer to the ***DEUTZ Engine Owner's Manual*** for engine technical questions or information recommended by Multiquip for this equipment. Damage to the equipment and or injury to user may result.
- Always use properly rated hoses and clamps — 1500 PSI and higher.

TRANSPORTING

- **ALWAYS** shutdown engine before transporting the pump.
- Tighten fuel tank cap securely to prevent fuel from spilling.
- Drain fuel when transporting pump over long distances or bad roads.

Towing

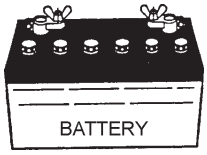
- Before towing, check the hitch and secure the safety chain to the towing vehicle.
- When towing, an adequate safety chain must be fastened to the frame, refer to Towing Guidelines.
- Tow only with a vehicle and hitch rated to pull a 6,000 lbs. load.
- If unit is equipped with ball hitch coupler, use only 2" all steel ball rated for minimum of 6,000 lbs. Use 1" hardened steel pull pin, if not equipped with ball hitch.
- This equipment shall not be towed or operated by individuals who cannot read understand the signs, decals or operating instructions.
- When towing at night, ***always*** have rear tail lights **ON**.
- **DO NOT** tow unit with hopper full of material.
- **DO NOT** tow unit with hoses attached.
- **DO NOT** tow unit in excess of **55 MPH** on highways.

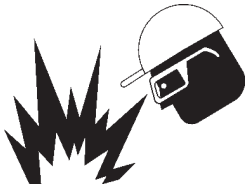
MAINTENANCE SAFETY

- **NEVER** lubricate components or attempt service on a running pump .
- **ALWAYS** allow the pump a proper amount of time to cool before servicing.
- Keep the pump in proper running condition.
- Fix damage to the pump immediately and always replace broken parts.
- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters.
- **DO NOT** use plastic containers to dispose of hazardous waste.

BATTERY

The battery contains acids that can cause injury to the eyes and skin. To avoid eye irritation, ***always*** wear safety glasses. Use well insulated gloves when picking up the battery. Use the following guidelines when handling the battery:





- **DO NOT** drop the battery. There is the possibility of risk that the battery may explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes etc. The battery contains combustible gases and liquids. If these gases and liquids come in contact with a flame or spark, an explosion could occur.
- **ALWAYS** keep the battery charged. If the battery is not charged a buildup of combustible gas will occur.
- **ALWAYS** keep battery charging and cables in good working condition. Repair or replace all worn cables.
- **ALWAYS** recharge the battery in an vented air environment, to avoid risk of a dangerous concentration of combustible gases.
- In case the battery liquid (dilute sulfuric acid) comes in contact with ***clothing or skin***, rinse skin or clothing immediately with plenty of water.
- In case the battery liquid (dilute sulfuric acid) comes in contact with your **eyes**, rinse eyes immediately with plenty of water, then contact the nearest doctor or hospital, and seek medical attention.

EMERGENCIES



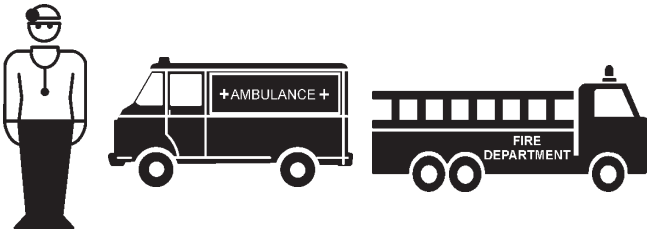
- **ALWAYS** know the location of the nearest ***fire extinguisher.***



- **ALWAYS** know the location of the nearest and ***first aid kit.***



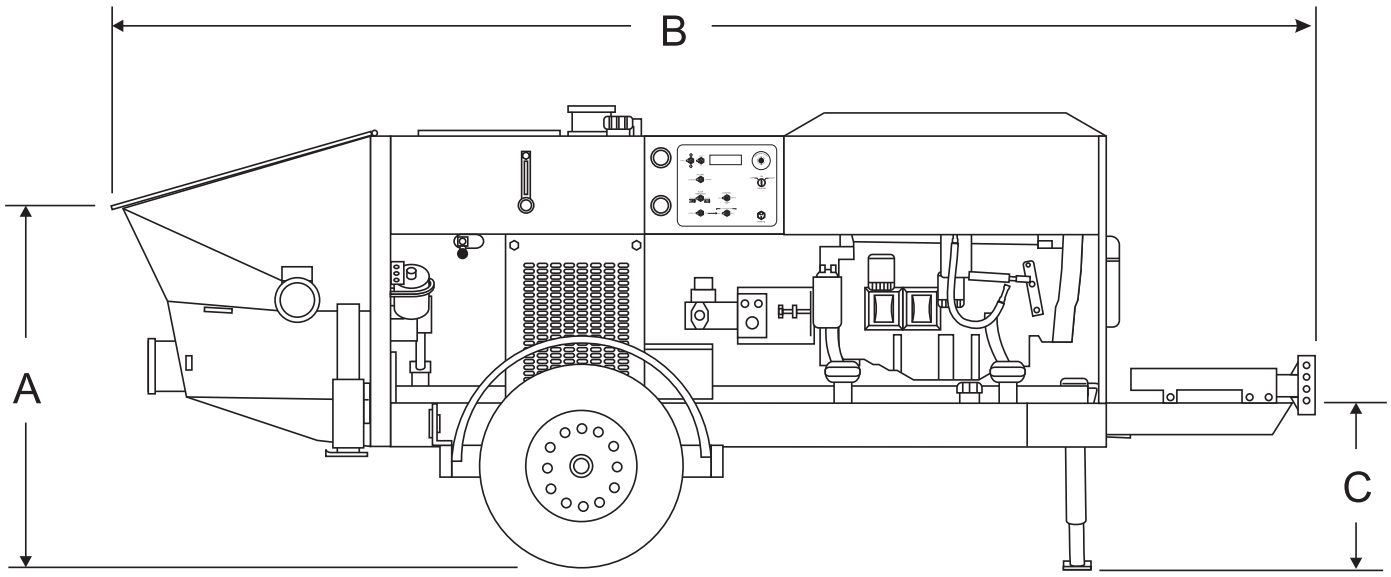
- In emergencies ***always*** know the location of the nearest phone or ***keep a phone on the job site***. Also know the phone numbers of the nearest ***ambulance***, ***doctor*** and ***fire department***. This information will be invaluable in the case of an emergency.



NOTES

TABLE 1. PUMP SPECIFICATIONS	
Model	LS-600
Pumping Rate	Up to 60 cu. yds. per hour*
Pumping Method	Reciprocating Piston
Maximum Aggregate Size	1-1/2 in. minus (38mm)
Vertical Pumping Height	Up to 250 ft. (76m)
Piston Face Pressure	1100 PSI
Horizontal Pumping Distance	1000 ft. (305m)*
Cylinder Lubrication Box Capacity	2 Gallons (7.6 Liters)
Hydraulic Fluid Capacity	50 Gallons (189 Liters)
Fuel Tank Capacity	40 Gallons (76 Liters)
Hopper Capacity	10 cu. ft. with optional fwd/rev remixer
Material Hose	3 in., 4 in., 5 in. dia. (76.2mm, 101.6 mm, 127 mm)
Engine Model	Deutz Turbo Diesel BF4L914
Weight (with fluids)	5,190 lbs. (2,354 kg)
Weight (dry/shipping)	4,760 lbs. (2,159 kg)
Tire Size	15 in. (381 mm)
Options	Wireless Remote Control, Hopper Screen Vibrator
*Volume output will vary depending on mix design, slump, line size used and job site condititons	

TABLE 2. ENGINE SPECIFICATIONS	
Model	Deutz BF4L914 Diesel Engine
Type	4 stroke, Air-cooled Diesel
No. of Cylinders	4
Bore x Stroke	4.19 in. x 5 in. (106 mm x 127 mm)
Rated Output	99.9 HP@ 2350 rpm
Displacement	167 cu. in. (2.73 L)
Starting	Electric 12VDC
Lube Oil Capacity	9.5 gal. (2.5 liters)
Fuel Type	#2 Diesel Fuel
Battery	12V BCI Group 27



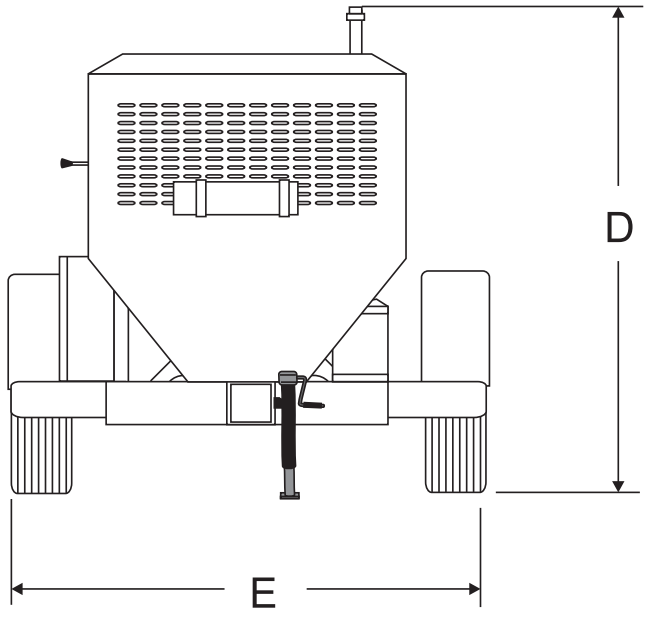


TABLE 3. DIMENSIONS	
REF.	**DIMENSIONS**
A	43 in. (109.2 cm.)
B	173 in. (436.8 cm.)
C	24 in. (61 cm.)
D	70 in. (177.8 cm.)
E	68 in. (172.2 cm.)

Figure 1. Dimensions

Figure 2 displays the basic hand signals commonly used in concrete pumping operations.

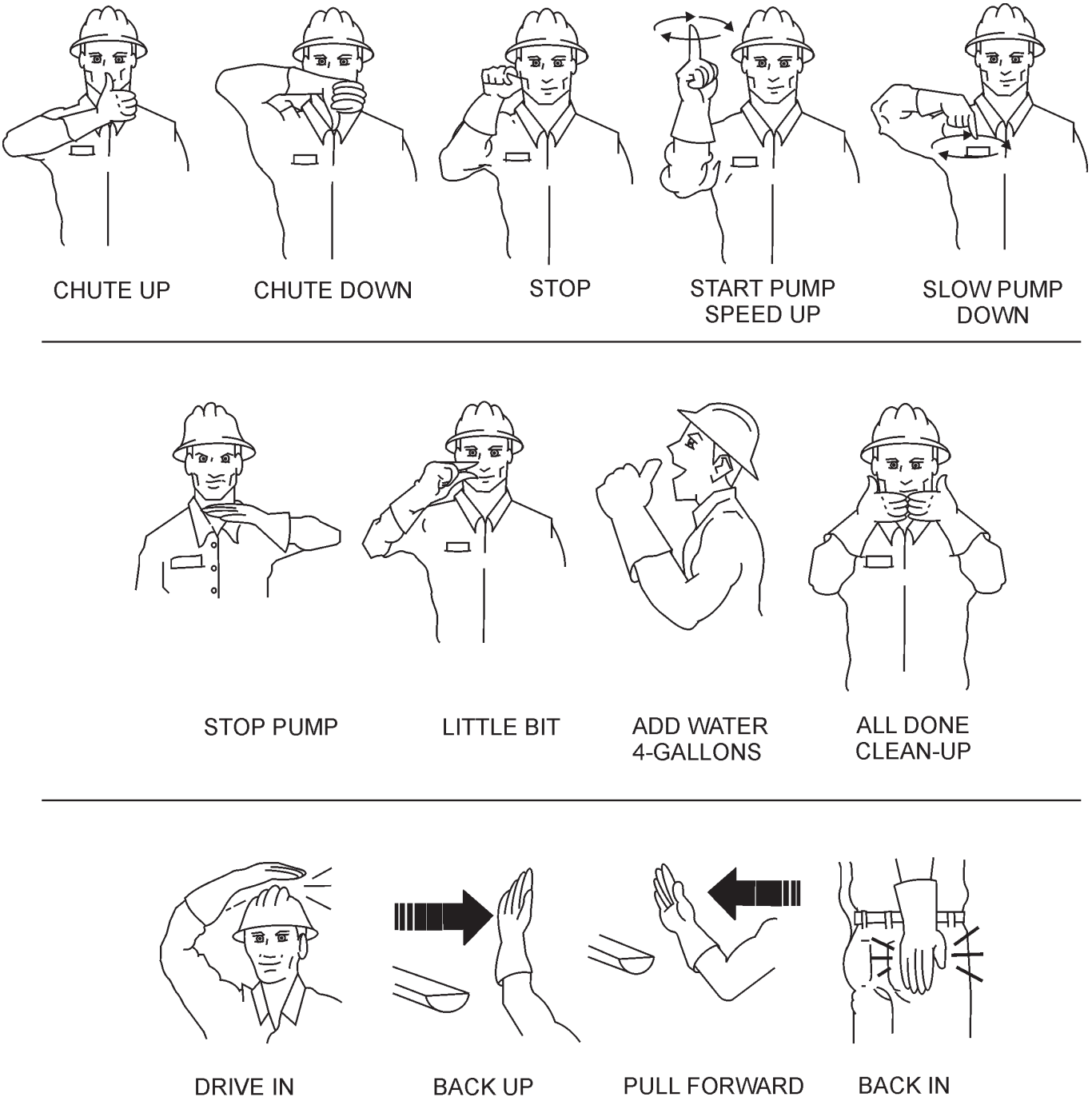


Figure 2. Operation Hand Signals

CONCRETE MIX DESIGN

Mix design is most important to achieve maximum pumpability. Pumpability is affected by, among other factors, the type and gradation of aggregate used. Natural aggregates make a more workable mix and pump more readily than crushed aggregates. A blend of natural and crushed aggregates will produce a workable mix. The type and gradation of aggregates is equally important for workability as the size and percentage of coarse aggregates in the mix.

The term “aggregates” describes all of the solid materials, from the largest rock to the smallest grain of sand, contained in the concrete mix.

Concrete mixes with a consistency as dry as one-inch slump and as wet as ten-inch slump have been pumped; but for maximum efficiency from the pump, a slump ranging from two to six inches will produce a more workable mix than one that contains more or less water.

The principle of concrete pumping is based on self-lubrication. As it moves through the transfer line, the concrete takes the shape of a plastic cylinder. It is forced through the transfer line on a film of mortar that is self-troweled to the service of the transfer line around its full periphery by the slug of concrete itself.

A slump rating should be used with discretion; it is not always a real indication of the pumpability of the mix. The concrete may be workable in the sense that it will readily flow into place, but the same mix may not respond to pressure. Overly wet mixes tend to separate. In addition to affecting the strength and quality of the concrete, the delivery system will not tolerate separation. Overly dry mixes are similarly unsatisfactory if they lack plasticity and tend to be crumbly. To be properly pumped, the mix must be able to continuously coat the inside of the line with a lubricating seal of mortar.

There are four ways in which this seal can be lost:

1. By pumping excessively wet mixes which do not have enough cohesion to hold together.

2. By pumping harsh undersanded concrete with poorly graded aggregates which can jam together when the pressure becomes too great for the insufficient amount of sand to hold the aggregates apart.

3. By getting a rock pocket, such as mixer tailings, into the pump valve. This rock pocket will have an insufficient coating of mortar and the mix will not be plastic enough to allow the valve to operate or the mix to move in the line.

4. Through excessive bleeding. If the mix is short or fines, but the sand is otherwise fairly well graded, bleeding will not normally create any problems as long as the pump continues operation. But, if the pump is shut down, bleeding can result in a loss of lubrication and blocked erratic flow.

The above are bad concrete practices, regardless of how the mix is to be placed. But, these points do show that special mixes are not always needed, within limits, for pumping concrete. Good aggregate gradation is most important to pump concrete the maximum distance.

The use of admixtures can have a beneficial effect on pumpability. Most of the dispersing agents will fatten, retard bleeding, and increase workability. Thus, the average concrete can be pumped for appreciably longer distances. Air entraining agents will also improve workability, although they cannot be used as a substitute for good gradation of the aggregate. Pumping will not appreciably affect the final air content of the mix. High-early cement tends to give a

more readily pumpable mix with superior water retaining qualities. However, if delays are likely to occur, extra care must be exercised due to the faster setting time over regular cement.

The Mayco LS600 models will pump a wide variety of concrete pump mixes. But, there are guidelines that must be followed. Use this information in conjunction with the ***Operation*** section of this manual.

REGIONAL DIFFERENCES

Concrete is made by mixing locally available rock and sand with cement and water. For this reason there are great differences in the pumpability of concrete from one region of the country to another.

It is impossible to define a specific mix for each region that the concrete pump be will working in. Therefore, the mixes listed in **Appendix - Concrete Mix Information** will provide a basic guideline for establishing the proper mix design for your area.

Use this information to specify your requirements to your local ready-mix batch plant, contractor and civil engineer. It may take minor adjustments to make a mix pumpable, so you should explain your needs.

The elements that have to be controlled and consistently maintained by the batch plant are:

1. The sizing and mix percentage of rocks, gap graded from the largest down through the smallest sizes.
2. Sand with a sieve analysis that has the proper percentage of fines, ASTM C33 spec.
3. Sufficient cement to produce the required design strength of the concrete and provide the lubricating binder to pump the concrete through the delivery system.

Use a minimum of:

500 lbs. of cement/cu yd for 2500 p.s.i. concrete after 28 days.

530 lbs. of cement/cu yd for 3000 p.s.i. concrete after 28 days.

600 lbs. of cement/cu yd for 4000 p.s.i. concrete after 28 days.

4. Admixture pump-aid if necessary.
5. The proper amount of water to make a workable slump and plasticize the mix.

In addition, this Mayco Concrete Pump can be used to pump a large aggregate hard rock as follows:

1. Pea rock (1/2" minus) pump with mixes being as low as 30% rock and 70% sand. (See page 44, for comments on cleaning the pump.)
2. Shortening pea rock when used with an air compressor and nozzle. (See back pages for recommended setup.)
3. “Mud Jacking”, high pressure grouting.

The following is a brief explanation of how the concrete cylinders, hydraulic cylinders, shuttle tube, valves and hopper work in sequence to pump concrete.

The hydraulic pressure is generated by a variable volume, pressure compensated, axial piston pump that is driven by a diesel engine. The rod sides of the drive cylinders are hydraulically connected together creating a "slave circuit," which allows hydraulic oil to transfer from one piston to the other.

The two part cycling sequence is initiated by an electrical signal generated by two proximity switches activated by the drive cylinder. The proximity switches are normally open, magnetically sensing the movement of the main drive cylinder. As the drive cylinder piston head passes the proximity switch, an electrical signal is sent to the solenoid operated pilot valve which in turn directs pilot oil to the four valves controlling the drive cylinder and the shuttle cylinder.

A one-gallon accumulator assists the movement of the shuttle tube. This circuit assures that the shuttle tube will throw with the same intensity of each stroke regardless of how fast the main drive cylinders are cycling.

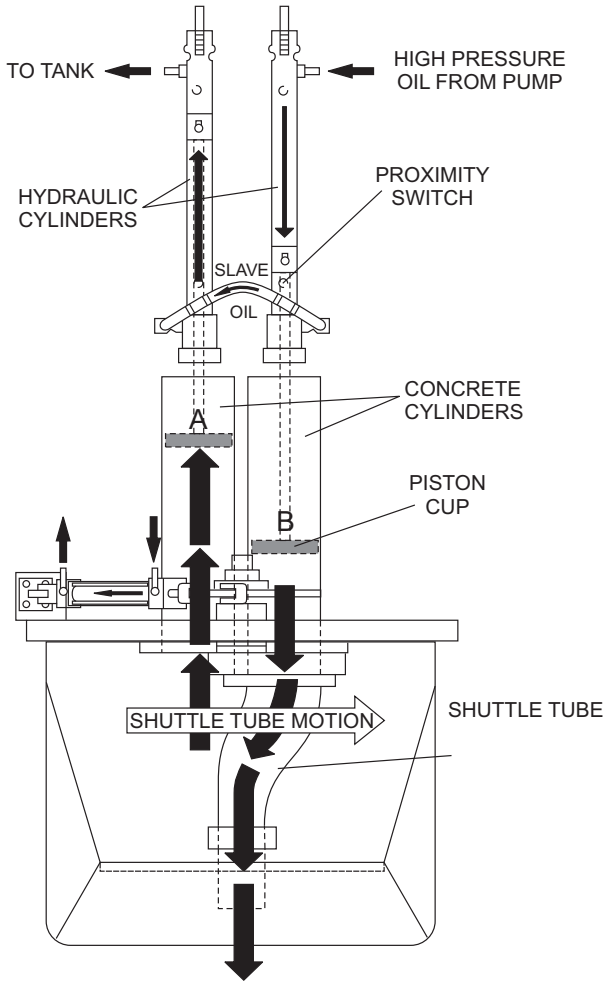


Figure 3. Pumping Cycle 1

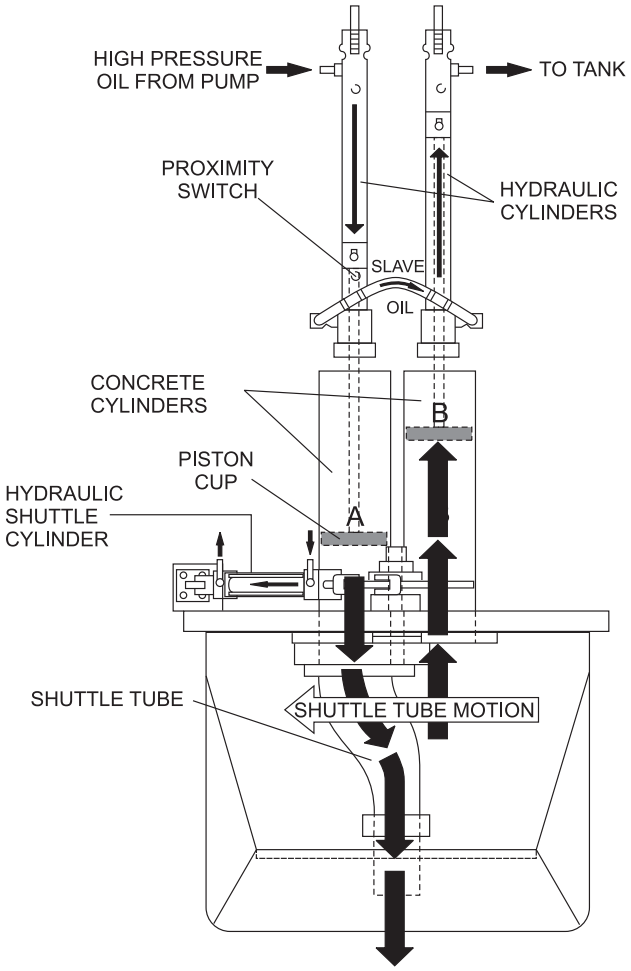


Figure 4. Pumping Cycle 2

In the first cycle, hydraulic pressure is applied to cylinder (**B**), causing the hydraulic piston, which is connected to the concrete piston and piston cup, to discharge concrete into the delivery line (Figure 3).

As one cylinder is discharging concrete, the hydraulic oil from the rod side (**B**) of the drive cylinders is being transferred through the slave circuit causing the opposite cylinder (**A**) to move back on the suction stroke, filling the cylinder with concrete.

The shuttle tube is sequenced to pivot to each concrete cylinder as the drive cylinders stroke to push concrete. As the second cycling sequence begins (Figure 4), the shuttle tube pivots to the opposite cylinder (**A**). The hydraulic piston passes under the proximity switch and sends pressure to the piston, causing it to stroke and discharge concrete into the delivery line. Hydraulic oil is transferred through the slave circuit to cylinder B, causing it to start a suction stroke, refilling it with concrete. The pumping sequence then repeats for the duration of the operation.

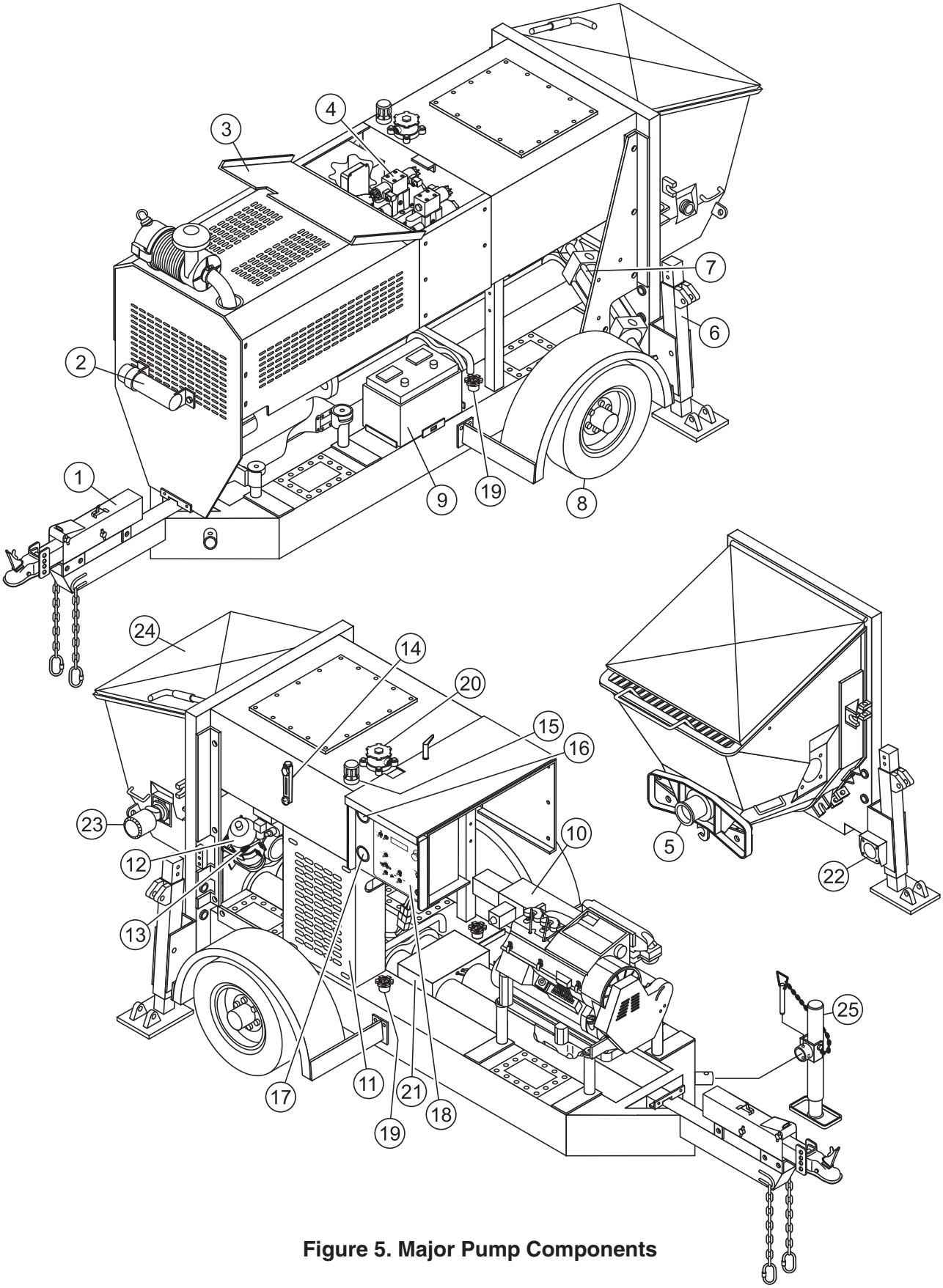


Figure 5. Major Pump Components

Figure 5 illustrates the location of the major components for the LS600 Concrete Pump. The function of each component is described below:

1. **Tow Hitch Coupler –** Requires a 2-inch ball hitch or a 3-inch pintle. Capable of towing 6,000 lbs.
2. **Documentation Box –** Contains engine and pump operation, parts and maintenance information.
3. **Manifold Access Door–** Release latch and lift door to access the Hydraulic Manifold Block.
4. **Hydraulic Manifold Block –** Manifold block that controls the flow of hydraulic pressure to the components required to control the pump.
5. **Hopper Discharge Sleeve –** Connect hoses or steel pipes to the discharge sleeve for pouring concrete.
6. **Pump End Jack Stand –** Use this jack stand to level and support the rear end of the pump. **NEVER** deploy on un-level ground and always check for firmness of ground.
7. **Shuttle Cylinder –** Under pressure, the shuttle cylinder shears concrete passing from the concrete cylinder to the delivery line during the cycle phase.
8. **Tires** — This trailer uses two ST205-750 x15E type tires. Tire inflation pressure is the most important factor in tire life. Pressure should be checked to ***50 psi cold*** before operation. **DO NOT** bleed air from tires when they are hot. Check inflation pressure weekly during use to insure the maximum tire life and tread wear.
9. **Battery –** This unit uses a +12 VDC type battery. **ALWAYS** use gloves and eye protection when handling the battery.
10. **Hydraulic Pump –** This unit incorporates an axial variable displacement hydraulic piston pump.
11. **Heat Exchanger –** Reduces temperature of the hydraulic oil. The exchanger draws oil from the hydraulic tank through a filter and into the heat exchanger before allowing it to flow into the hydraulic system.
12. **Accumulator –** Stores hydraulic oil under pressure and releases it to the shuttle cylinder and provides the pressure needed to ensure enough force is provided during cycle.
13. **Remixer Control Lever –** Controls the forward/reverse motion of the hopper remixer paddles.
14. **Hydraulic Oil Sight Glass –** Use to determine the amount of hydraulic oil remaining in tank. The sight glass also contains a temperature gauge for monitoring the temperature of the hydraulic oil.
15. **Hydraulic Oil Tank/Cap–** Remove cap to add hydraulic fluid. Fill with Shell Oil Tellus 68 or Mobil Oil DFE26 if level is low.
16. **Accumulator Pressure Gauge–** Used to monitor accumulator pressure. Pressure should read at least 1750 psi for correct pump operation.
17. **Pumping Pressure Gauge –** Used to monitor pressure in the concrete cylinders and shuttle tube.
18. **Control Box –** Contains the electrical components required to run the pump. See Control Box Components section for component callouts.
19. **Fuel Tank/Cap –** Fill with diesel fuel. Fuel tank (cell) holds approximately 40 gallons (176 liters). **DO NOT** top off fuel. Wipe up any spilled fuel immediately.
20. **Hydraulic Oil Filter –** This in-tank return hydraulic filter with a 10 micron cleanable filter is designed to remove all particles large enough to cause wear and job break down. Under normal conditions, replace every 6 months.
21. **Lubrication Box –** This box is empty when shipped from the factory. Please fill with 3 gallons (11.35 liters) of SAE 30 motor oil for first time use. Also check the dual clean-out point on bottom of lubrication box for a secure tight fit.
22. **Rear Running Lights – ALWAYS** check and make sure both the right and left running lights are functioning correctly before towing the pump.
23. **Remixer Motor –** Drives the remixer paddles inside the hopper. The motor direction is controlled by the remixer control lever.
24. **Hopper/Hood –** Lift hood to fill. Concrete from a Redi-Mix truck is poured into this hopper. The hopper can hold 10 cu. ft of concrete with optional forward/reverse mixer. **NEVER** put hands or any other parts of you body into the hopper.
25. **Tow End Jack Stand –** Use this jack stand to level and support the tow end of the pump.

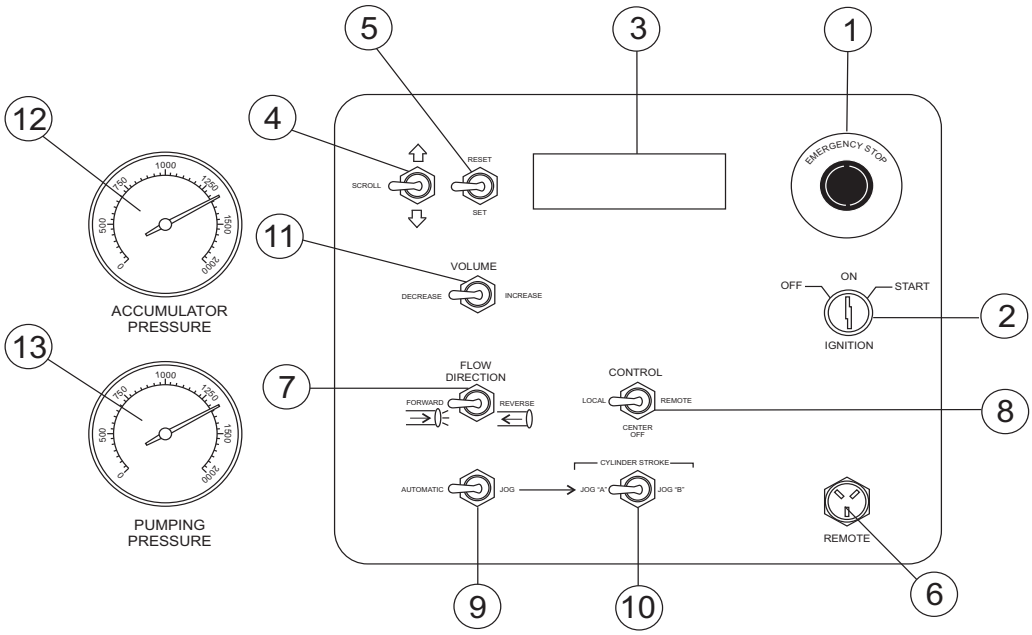


Figure 6. Pump Digital Control Panel Components

1. **Emergency Stop Button –** Press emergency stop button to stop pump in an emergency. Turn knob counterclockwise to disengage the stop button.
2. **Ignition Switch –** Insert the ignition key here to start the engine. Turn the key clockwise to the **ON** position, then continue turning clockwise to the **START** position and release. To stop the engine turn the key fully counterclockwise to the **STOP** position.
3. **Digital Readout Screen –** Displays and monitors the various functions of the machine.
4. **Scroll Switch –** Allows the operator to scroll the various readout screens.
5. **Reset Switch –** Allows the operator to reset the stroke counter.
6. **Remote Cable Connector –** Insert the remote control input cable into this connector.
7. **Direction Control Switch –** This 2-position switch controls the direction of flow for any mix in the pump. The ***leftmost*** position sets the pumping direction to forward and the ***rightmost*** position sets the pumping direction to reverse.
8. **Pumping Control Switch –** This 3-position switch controls the pumping of the pump. The ***rightmost*** position (REMOTE) is for use with the remote control unit, the ***leftmost*** position (LOCAL) is for normal pumping operation, and the ***centermost*** position (CENTER OFF) prevents pumping.
9. **Cylinder Stroke Control Switch –** This 2-position switch controls the pumping function. The ***leftmost*** position (AUTOMATIC) sets the pump to ***automatic cycling***. Set the switch to this position for normal pump operation.

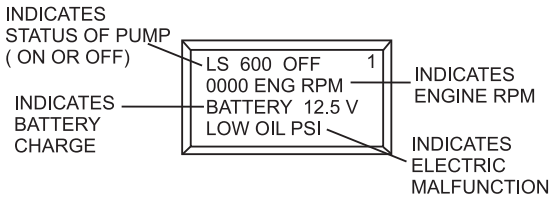
 The ***rightmost*** position (JOG) changes the pump from automatic to ***manual cycling***. This allows the cylinders to be manually cycled using the ***Manual Cylinder Jogging Switch***.
10. **Manual Cylinder Jogging Switch –** This 2-position switch allows the operator to manually jog the cylinders to assist in clearing material line packs and is used to test pumping pressure (See ***Initial Start-up Procedure*** section of this manual for testing procedure).

 The ***leftmost*** position jogs Cylinder "A" and the ***rightmost*** position jogs Cylinder "B".
11. **Stroke Volume Control Switch –** Increases or decreases the number of strokes per minute of the pump.
12. **Accumulator Pressure Gauge –** This gauge monitors the internal pressure of the Accumulator tank. Normal internal pressure should read approximately 1750 PSI during pumping.
13. **Main Pressure Gauge –** This gauge monitors the system pressure while pumping material. The maximum pressure rating is 4400 PSI ± 50.

PRIMARY SCREEN

Screen 1

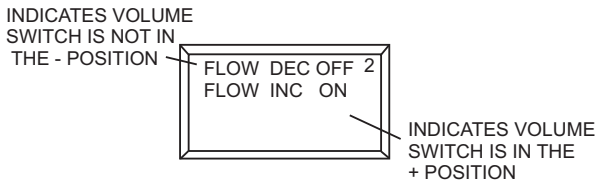
Indicates the various modes of the switch settings.
Monitors engine RPM - Idle speed 900, High speed 2550.
Battery charge indicator - Normal charge 13+ volts.
Indicates electrical malfunction - Refer to Troubleshooting section.



SECONDARY SCREENS

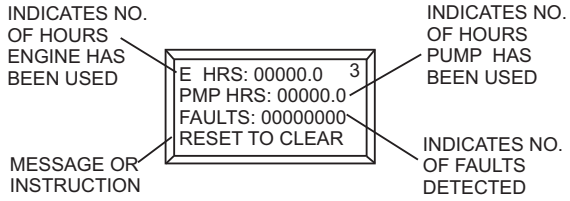
Screen 2

Displays the position of the VOLUME CONTROL switch by indicating whether the increase or decrease position is on or off.



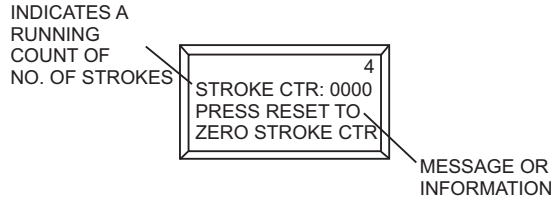
Screen 3

Displays the number of hours the engine and pump have been used and the number of faults the pump has registered. All three indicators can be reset to zero by the RESET switch on the control panel.



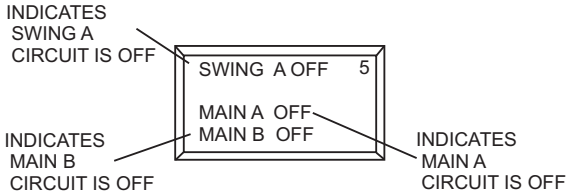
Screen 4

Displays the number of strokes the main hydraulic cylinders have gone through. This indicator can be reset to zero by the RESET switch on the control panel.



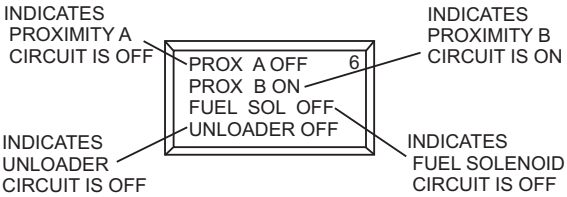
Screen 5

Displays the ON/OFF electrical signal status of the various 12 volt solenoids (Swing A circuit, Main A circuit, Main B circuit).



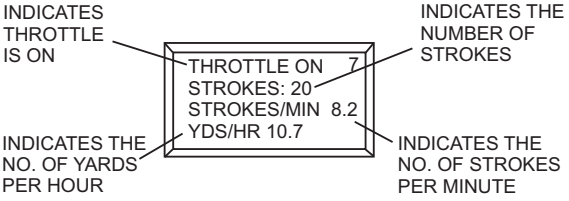
Screen 6

Displays the ON/OFF electrical signal status for the Proximity Switch A, Proximity Switch B, Engine Fuel Solenoid, and Unloader Solenoid.



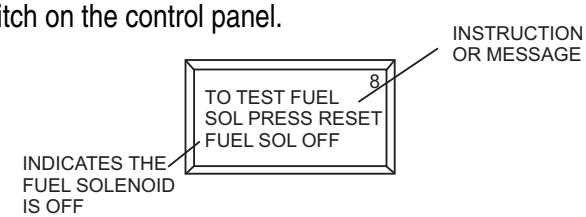
Screen 7

Displays the number of times the main hydraulic cylinders stroke and the yards per hour output. This indicator can be reset to zero by the RESET switch on the control panel.



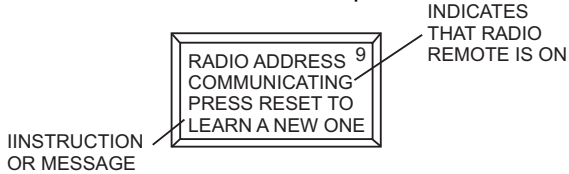
Screen 8

Displays the electrical status of the engine fuel solenoid. To test the 12-Volt solenoid status, activate with the RESET switch on the control panel.



Screen 9

Displays the communication status of the (optional) radio remote control. To activate a new remote control connection, use the reset switch on the control panel.



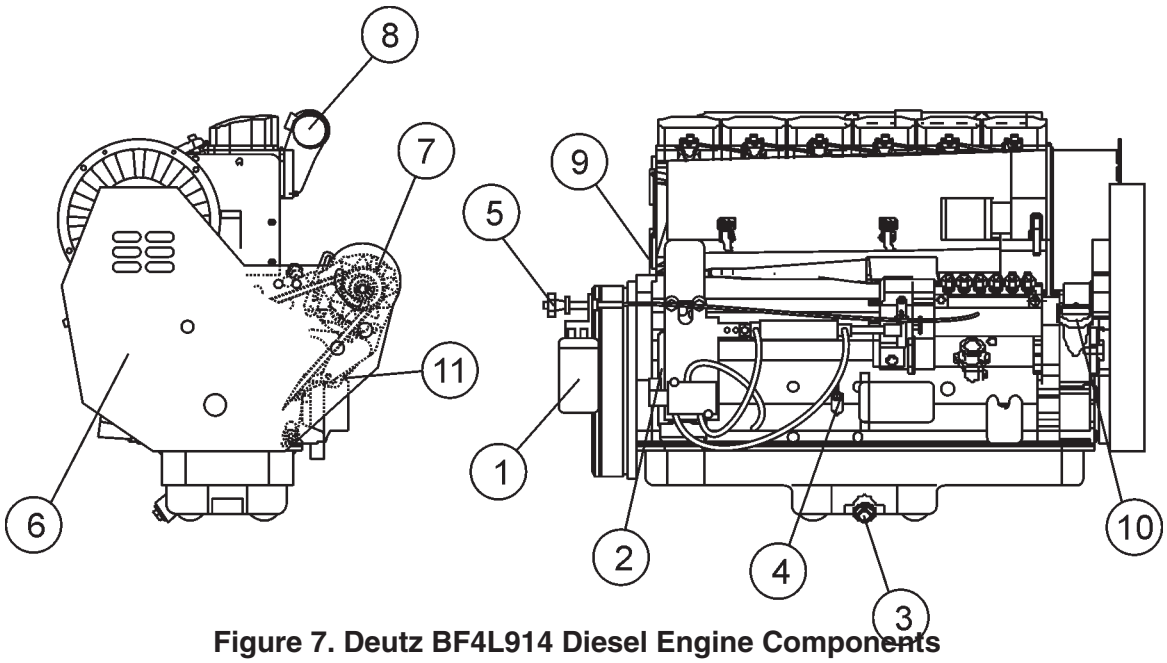


Figure 7. Deutz BF4L914 Diesel Engine Components

The engine (Figure 7) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the manufacturers Engine manual for instructions & details of operation and servicing.

1. **Fuel Filter/Water Separator –** Service the fuel filter as recommended in the maintenance section of this manual.
2. **Oil Filter –** Prevents dirt and other debris from entering the engine. Service the oil filter as recommended in the maintenance section of this manual.
3. **Crankcase Drain Plug –** Remove this plug to drain engine oil from the engine crankcase. For best results drain engine oil when oil is warm.
4. **Dip Stick –** Remove dipstick to determine if the engine oil level is low. If low add oil as specified in Table 4.
5. **Engine Throttle Knob–** This is a variable speed type control. Turning the throttle lock (CCW) left unlocks the throttle allowing the throttle control cable to be pulled out to the desired position. Once the desired throttle position (speed) has been achieved, turning the throttle lock to the (CW) right locks it in place.
6. **V-Belt Cover –** Remove this cover to gain access to the V-belt. When replacing V-belt , use only recommended type V-belt.
7. **Alternator –** Provides power to the electrical system. Replace with only manufacturers recommended replacement parts.
8. **Air Intake –** Attach the Air Filter Hose to the Air Intake.
9. **Muffler –** Used to reduce noise and emissions. **NEVER** touch the muffler while it is hot! Serious burns can result. **NEVER** operate the engine with the muffler removed.

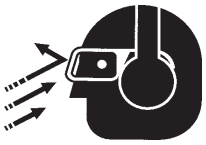


10. **Oil Filler Port/Cap –** Remove this cap to add engine poil to the crankcase. Fill with recommended type of oil as specified in the maintenance section of this manual.
11. **Starter/Solenoid –** This engine uses a 12 VDC , 2.7kW (3.7 HP) starter motor with solenoid.

⚠ CAUTION - GENERAL SAFETY GUIDELINES



NEVER operate the pump in a confined area or enclosed area structure that does not provide ample ***free flow of air***.



ALWAYS wear approved ***eye*** and ***hearing*** protection before operating the pump .



NEVER operate the pumps's engine with the engine hood removed. The possibility exists of ***hands***, ***long hair***, and ***clothing*** becoming entangled with the V-belt, causing injury and bodily harm.

NEVER place hands or feet inside the ***hopper***. **ALWAYS** make while the engine is running. **ALWAYS** shut down the engine before performing any kind of maintenance service on the pump.



See Figures 5, 6, and 7 for the location of any control or component referenced in this section.

BEFORE STARTING



1. Read safety instructions at the beginning of manual.
2. Clean the ***entire pump***, removing dirt and dust, particularly the engine cooling air inlet, and heat exchanger.
3. Check the ***air filter*** for dirt and dust. If air filter is dirty, replace air filter with a new one as required.
4. Check fastening nuts and bolts for tightness.

⚠ WARNING - EXPLOSIVE FUEL

Handle fuel safely. Diesel fuel is highly ***flammable*** and can be dangerous if mishandled. **DO NOT** ***smoke*** while refueling. **DO NOT** attempt to refuel pump if the engine is hot or running. **ALWAYS** allow engine to ***cool*** before refueling.

FUEL CHECK

1. Check the fuel gauge built into the fuel tank cap (Figure 8) to determine if the pump's engine fuel is low. Refuel as needed.

⚠ WARNING - EXPLOSIVE FUEL



Diesel fuel is extremely flammable, and its vapors can cause an explosion if ignited. **DO NOT** start the engine near spilled fuel or combustible fluids. **DO NOT** fill the fuel tank while the engine is running or hot.

DO NOT overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system. Store fuel in approved containers, in well-ventilated areas and away from sparks and flames. **NEVER** use fuel as a cleaning agent.

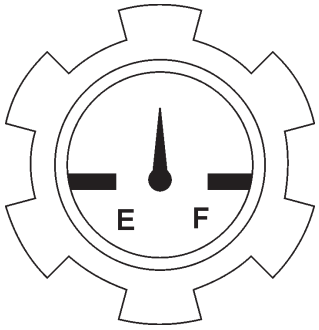


Figure 8. Fuel Cap Gauge

2. If fuel is low, remove fuel filler cap and fill with ***#2 diesel fuel*** (Figure 9).

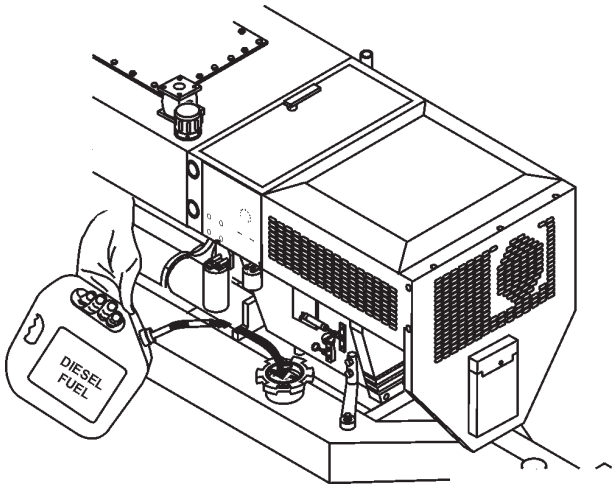


Figure 9. Adding Diesel Fuel

ENGINE OIL CHECK

1. Remove the engine oil dipstick from its holder (Figure 10).

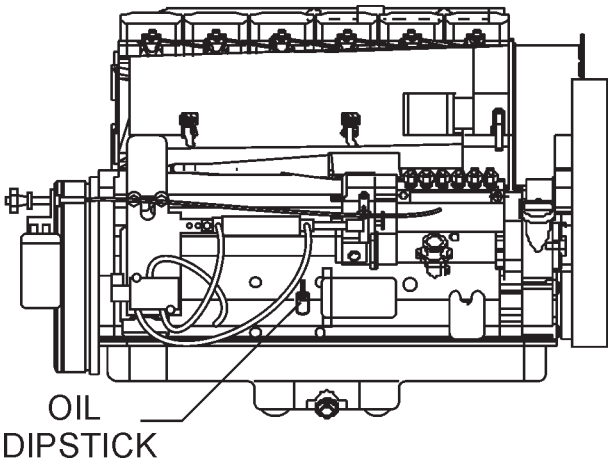


Figure 10. Engine Oil Dipstick

2. Make sure pump/engine is placed on level ground.
3. Pull the engine oil dipstick (Figure 11) from its holder.

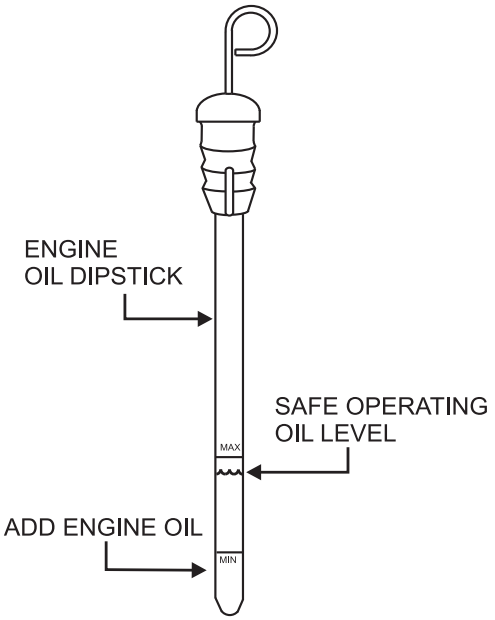
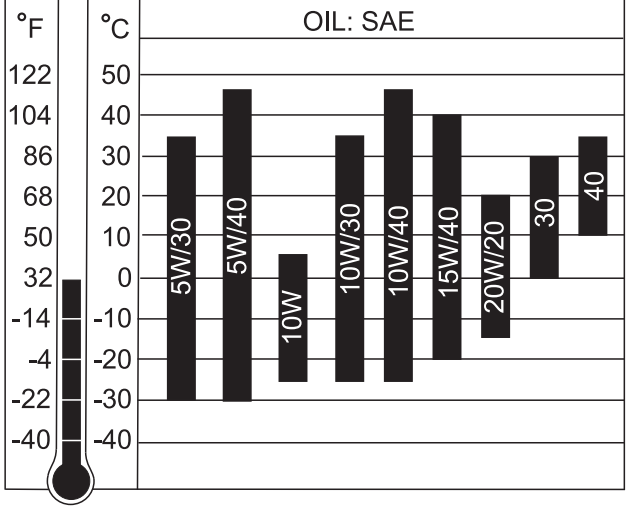


Figure 11. Engine Oil Level

4. Verify that oil level (Figure 11) is maintained between the two notches on the dipstick.
5. If the pump's engine oil is low, fill engine crankcase with lubricating oil through filler hole, but **DO NOT** overfill.
6. The oil listed in Table 4 is recommended to ensure better engine performance. Use class CD or higher grade motor oil.

Table 4. Oil Selection Chart



HYDRAULIC OIL CHECK

1. Determine if the hydraulic oil level is low by observing the level of the oil in the **Hydraulic Oil Sight Glass** (Figure 12).

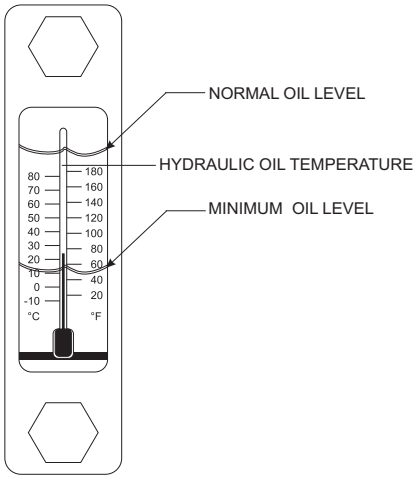


Figure 12. Hydraulic Oil Sight Glass

2. If the hydraulic oil level is low, remove the cap just above the oil level sight glass (Figure 13) and add the correct amount of hydraulic oil to bring the hydraulic oil level to a normal safe operating level. (Use Shell oil Tellus 68 or Mobil oil DFE26).

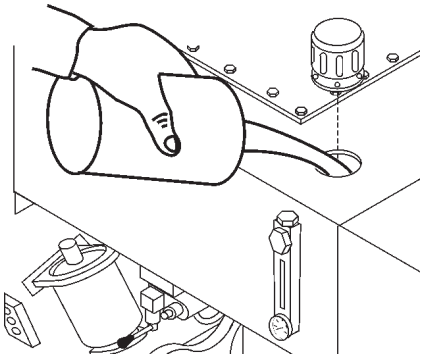


Figure 13. Hydraulic Oil Filler Hole

3. Check the oil level in the ***lubrication box***. If low, fill with up to 3 gallons of SAE #30 motor oil (Figure 14). The oil level must be checked daily. The lubrication box should be serviced as described in the maintenance section.

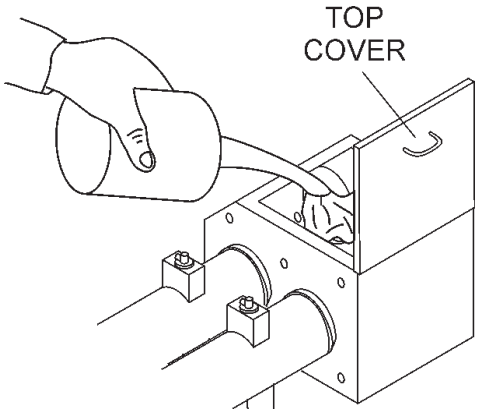


Figure 14. Filling the Lubrication Box

LOCATION OF PUMP

1. Place the pump in the best location on the site to pump concrete efficiently.
2. Lay down the hose in the shortest distance possible.

REAR STABILIZER JACKS

To reduce excessive vibration and rocking of the pump, set the rear stabilizers as follows:

1. Locate both the left and right rear stabilizer jacks (Figure 15).

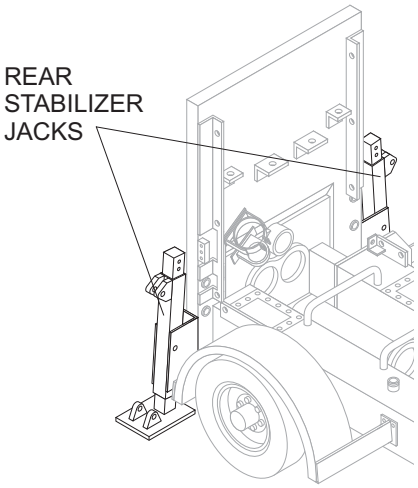


Figure 15. Locating Rear Stabilizer Jacks

2. Remove the ***cotter pin*** from the handle tee bolt eye, and then ***pull*** the handle tee to release the stabilizer jack (Figure 16).
3. Position both rear stabilizers jacks on firm (not loose) ***level*** ground (Figure 17).
4. Align the hole on the stabilizer jack with the hole on the frame body and ***insert*** handle tee bolt.
5. Insert the cotter pin into handle tee bolt eye to lock the stabilizer jack.

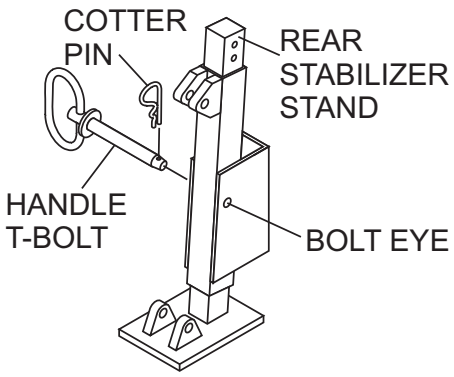


Figure 16. Rear Stabilizer Jack

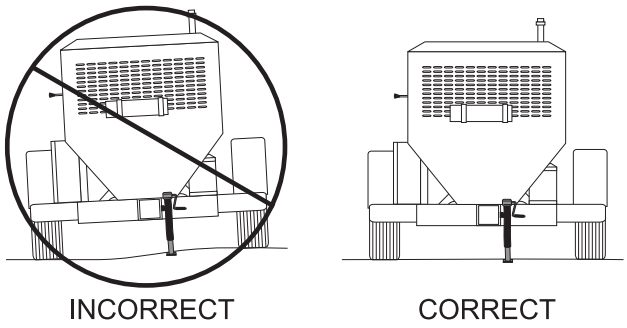


Figure 17. Rear Stabilizer Stand Deployment

HYDRAULIC REAR STABILIZER JACKS (OPTIONAL)

If your pump comes equipped with hydraulic rear stablizers, they can be controlled as follows:

1. Push down the middle control lever (see Figure 18) to extend the right hydraulic rear stabilizer.
2. Push up the middle control lever (see Figure 18) to retract the right hydraulic rear stabilizer.
3. Push down the rightmost control lever (see Figure 18) to extend the left hydraulic rear stabilizer.
4. Push up the rightmost control lever (see Figure 18) to retract the left hydraulic rear stabilizer.

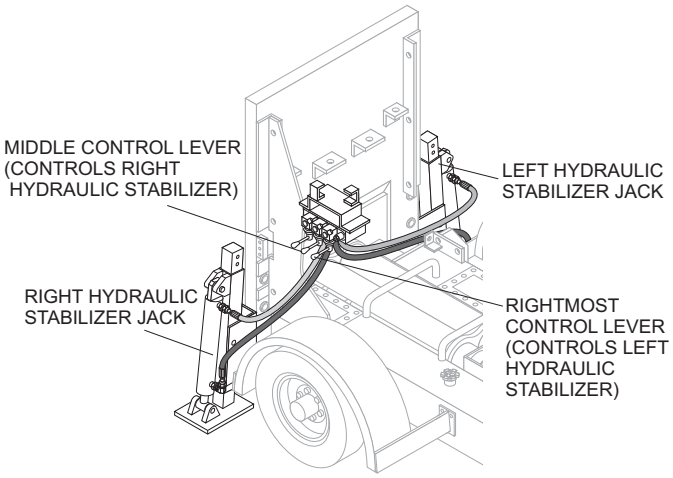


Figure 18. Control Levers for Hydraulic Rear Stabilizers

⚠ WARNING - REAR STABILIZER SAFETY

NEVER place feet under jack while operating.

ALWAYS retract rear stabilizer jacks prior to towing.

ALWAYS retract rear stabilizer jacks prior to servicing to relieve load (working pressure).

STARTING PROCEDURE

⚠ WARNING - GENERAL SAFETY GUIDELINES

DO NOT attempt to operate this concrete pump until the Safety, General Information and Inspection sections have been read and understood.

1. Locate the Emergency Stop Switch (Figure 19) on the Hydraulic Pump Control Box. Turn the Emergency Stop switch clockwise and release (open). This will allow the engine to start.



Figure 19. Emergency Stop Switch



If the Emergency Stop switch is in the **CLOSED** position (stop), engine will not start. To start the engine, make sure the Emergency Stop switch is in the **OPEN** position (fully extended).

2. Turn the ***Cylinder Stroke Control Switch*** to the **AUTOMATIC** position (Figure 20).

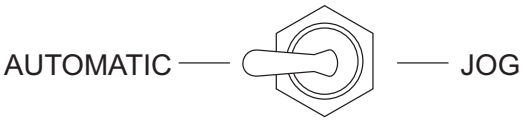


Figure 20. Cylinder Stroke Control Switch (Automatic)

3. Place the ***Pumping Control Switch*** to the **CENTER OFF** position (Figure 21) for normal pumping operation.

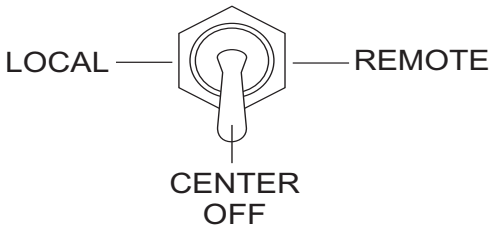


Figure 21. Pumping Control Switch (OFF)

4. Place the ***Direction Control Switch*** to the **FORWARD** position (Figure 22).

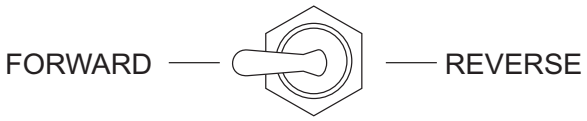


Figure 22. Direction Control Switch (FORWARD)

5. To start the engine, insert the key (Figure 23) into the ignition switch and turn the key to the **ON** position.

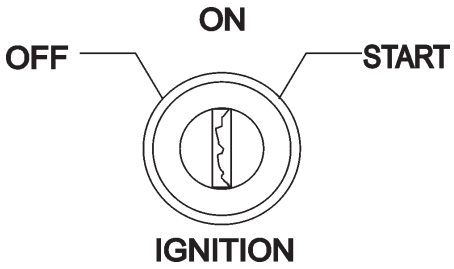


Figure 23. Ignition Switch

6. When the ignition key is in the **ON** position, the Digital Readout Screen (primary) will cycle through 3 displays as shown in Figure 24.

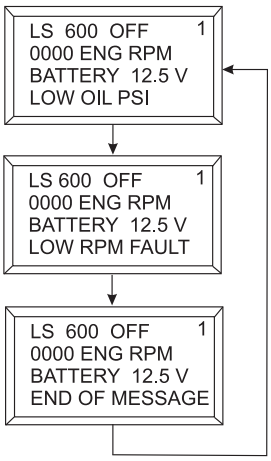


Figure 24. Primary Screen (Ignition Key ON)

7. Turn the key to the **START** position and listen for the engine to start. In warm weather let engine warm up for 5 minutes. In cold weather let engine warm up for 10 minutes.

HOSE LUBRICATION

Before pumping, it is necessary to lubricate the hose.

This procedure prevents separation and blockages in the hose. **Inspect the lines at all times to prevent problems.**

Before concrete is discharged into the hopper, it is suggested that 3 to 4 gallons of water be sprayed into the hopper, followed by approximately 5 gallons of a creamy cement and water slurry (1/2 bag of cement to 5 gallons of water).



Getting the concrete to flow through the hose at the start of the pumping cycle can be one of the most critical operations of the pour.

PRIMING THE PUMP WITH SLURRY MIXTURE

It is **CRITICAL** to the successful operation of a concrete pump that the manifold and all delivery hoses, pipes and elbows are coated with a film of lubrication **BEFORE** you attempt to pump concrete.

Failure to properly prepare the pump and system will result in a "dry pack" of concrete, blocking the shuttle valve tube or delivery line.

1. Connect the entire delivery system to the pump. Pour 5 gallons of water and a bag of raw cement into the hopper.
2. Place the ***Direction Control Switch*** to the **REVERSE** position (Figure 25). This will mix the water and cement into slurry.

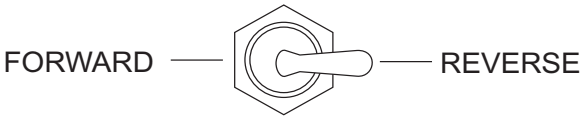


Figure 25. Direction Control Switch (REVERSE)

3. Mix the slurry to the consistency of a smooth batter.
4. Position the first ready-mix truck at the hopper. Check the concrete. **DO NOT** discharge concrete into hopper at this time.
5. Place the ***Direction Control Switch*** in the **FORWARD** position. This will start the flow of the slurry to the hoses.
6. Keep the slurry flowing until most of it is pumped out. However, make sure that some slurry is left on the hopper when concrete is first discharged from the ready-mix truck.

PUMPING

⚠ WARNING - SAFETY GLASSES



Safety glasses **MUST** be worn at all times when operating the pump. Failure to follow safety guidelines can result in ***serious*** injury.



A well-planned location of the pump and routing of the hose before starting a pour may save subsequent moves throughout the job.

1. Place the ***Pumping Control Switch*** to the **LOCAL** position (Figure 26) for normal pumping operation.

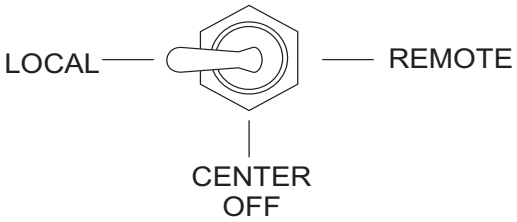


Figure 26. Pumping Control Switch (LOCAL)

2. Slide the ***Volume Control Switch*** (Figure 27) to the right to increase the volume to approximately **10 strokes per minute**. Sliding the volume control to the left will ***decrease*** pump volume.

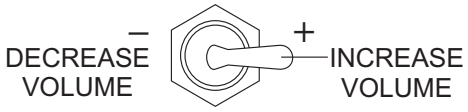


Figure 27. Volume Control

A ***thumping*** sound (cylinder stroke) should be heard. The thumping sound represents the number of strokes per minute (volume) of the pump.

3. Scroll through the ***Digital Readout Screen*** with the scroll switch to go to Screen 7 (Figure 28). This screen will show the volume in strokes per minute.

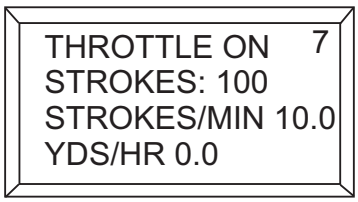


Figure 28. Strokes Per Minute Display

4. Let the pump cycle until the hydraulic oil temperature (Figure 29) is approximately 50° to 60° F.

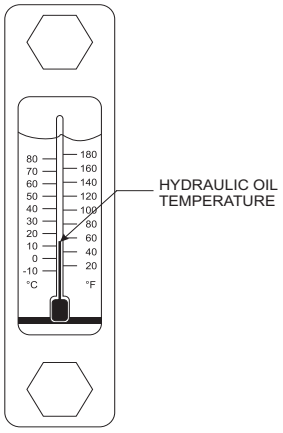


Figure 29. Hydraulic Oil Temperature Gauge

5. The **Accumulator Pressure Gauge** (Figure 30) should read approximately 1750 pounds per square inch (psi).

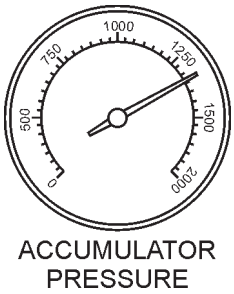


Figure 30. Accumulator Pressure Gauge

6. Push the Hopper Remixer Control Lever **DOWNWARD** (Figure 31). The Hopper Remixer Control lever is located to the left of the Hydraulic Temperature gauge. Observe that the blades (Figure 32) inside the hopper are turning in a clockwise direction (FORWARD). To turn the blades in a counterclockwise direction (REVERSE), push the Hopper Remixer Control lever **UPWARD** (Figure 31).

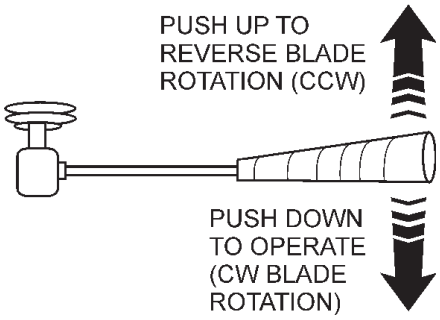


Figure 31. Hopper Remixer Control Lever

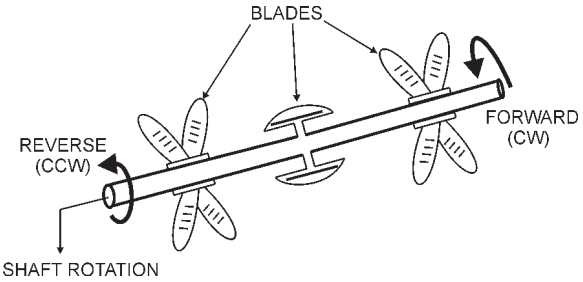


Figure 32. Hopper Remixer Blades (Rotation)

7. Slide the ***Volume Control Switch*** (Figure 27) to the right to increase the volume to 25-30 strokes per minute. Slowly discharge the concrete from the ready-mix truck into the hopper and completely fill it. Keep the pump running continuously until concrete is discharging at the end of the delivery system. If the pump is stopped during this procedure, a blockage may occur.

⚠ CAUTION - HOSE/LINE BLOCKAGE

If hoses or lines are ***blocked*** for any reason, or if the lines are ***kinked*** when starting up or during the pumping cycle, the pump pressure could straighten out the kink or force out the blockage. This rapid surge of material could cause the lines to ***whip*** or ***move*** in a manner that could cause injury to personnel.

8. It is important that once the slurry procedure is completed, and concrete is flowing through the hose, **DO NOT** stop the pour until all the slurry is pumped out and the concrete has reached the end of the hose. The only time to stop the pump during the priming procedure is if a blockage occurs.
9. If it is necessary to replace or add a section of delivery system, after the initial lubrication procedure, wet the inside area of the hose, pipe or elbow with 5 gallons of water per 25 foot length, before adding it to the system.



When pumping long distance or pumping stiff mixes, you can expect a drop in volume compared to shorter lines and wetter mixes due to the change in valve efficiency or cavitation.

REMOTE CONTROL (OPTIONAL)

The LS600 Concrete Pump has a remote control feature that allows the pump to be remotely controlled. If desired, the pump can be operated via a receiver/transmitter (radio) or a hardwire method, which utilizes a 25-ft. extension cable. Contact MQ Sales Department to order remote control.

Radio Remote Control

Installation of the Radio Remote Control Assembly

1. Remove the two screws on the digital control panel of the pump. See Figure 33.

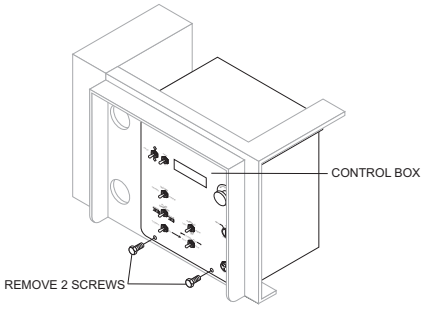


Figure 33. Removing Screws from Control Panel

2. Tilt and slowly pull out the control panel and place on top of box to gain access inside the box. See Figure 34.

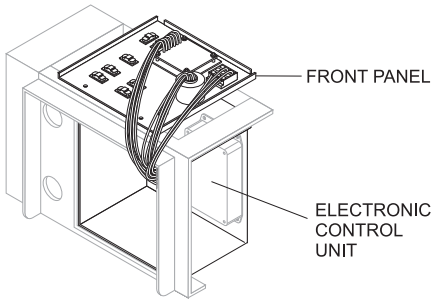


Figure 34. Pulling Out Control Panel

3. Install the wireless remote module with the 2 screws and nuts provided inside the control panel. Connect the 3-wire connector from the wireless remote module to the electronic control unit. See Figure 35.

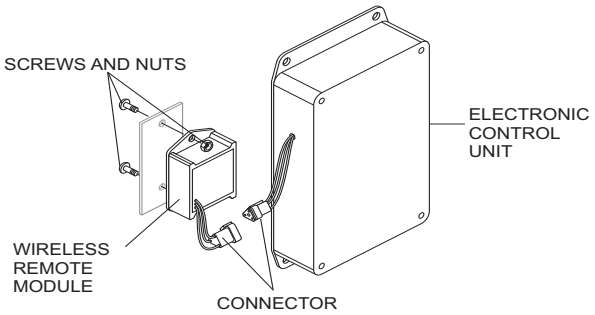


Figure 35. Installing Remote Control Module

4. Reinstall the control panel and tighten the 2 screws.
5. On the top of the unit, to the right of the control box (Figure 36), hammer out the knock-out hole and install the remote antenna.

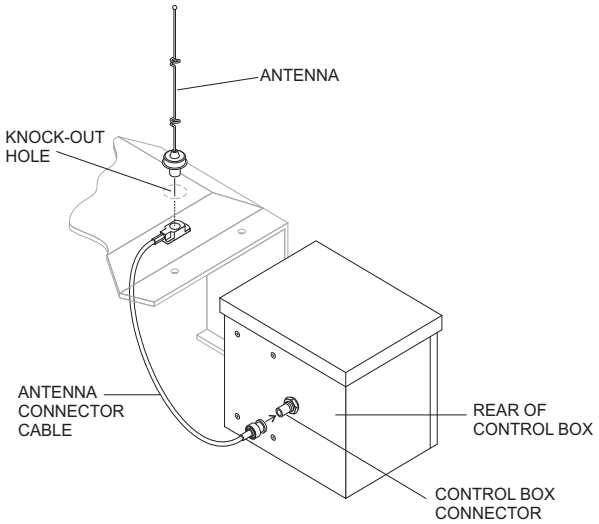


Figure 36. Antenna Installation

6. Connect the antenna cable to the connector on the rear of the control box (Figure 36).

Radio Remote Control Buttons Operation

The pumping operation can be performed by radio remote control (Figure 37). Before using remote control, move the Pumping Control Switch on the control box to the REMOTE position. The buttons on the remote control have the following functions.

ON/OFF - Turns the power on or off. When power is on the power LED lights red. If the battery LED turns red, 9V battery needs to be replaced.

E-STOP - Turns off the pump completely in an emergency.

PUMP ON/OFF - Starts and stops the forward pumping.

PUMP REV - momentarily pumps in reverse direction.

VOLUME (+) - used to increase the pumping volume.

VOLUME (-) - used to decrease the pumping volume.

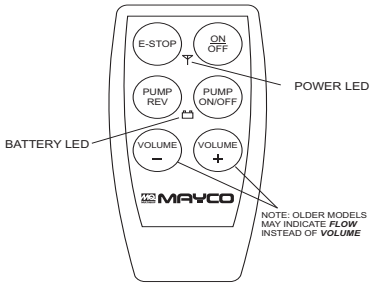


Figure 37. Radio Remote Control

Radio Remote Control Programming

Before starting operation of the Radio Remote Control, go to Screen 9 of the Digital Readout Screen:

RADIO ADDRESS 9
NO RADIO
PRESS RESET TO
LEARN A NEW ONE

1. Press the ON/OFF button on the radio (wireless) remote control to turn on the power. Hold down the RESET switch. The display will now show:

RADIO ADDRESS 9
NOW SCANNING
FOR NEW
TRANSMITTER

2. After 5 seconds, the display will show:

RADIO ADDRESS 9
COMMUNICATING
PRESS RESET TO
LEARN A NEW ONE

3. The remote control is now ready for use.

Cable Remote Control

Installation of the Cable Remote Control Assembly

Connect the cable to the front panel of the control box (See Figure 38).

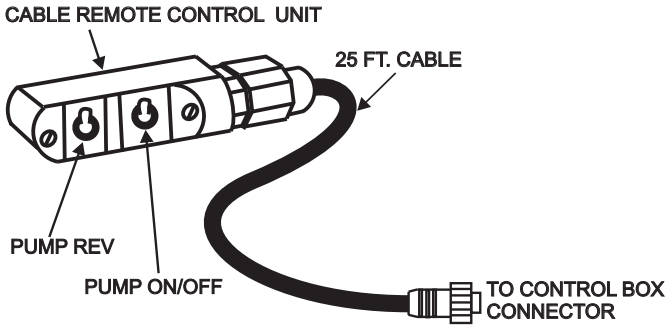


Figure 38. Cable Remote Control

Cable Remote Control Operation

Before using cable remote control, set the pumping volume with the VOLUME switch on the control box then move the Pumping Control Switch on the control box to the REMOTE position.

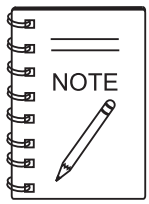
The cable remote control (Figure 38) has the following controls.

PUMP ON/OFF - Starts and stops the forward pumping.

PUMP REV - starts pumping in reverse direction.

⚠ WARNING - TRANSPORTING PUMP

It will be necessary at times to move your pump from one job site location to another. Before moving the pump, make sure to pump the remaining concrete out of the hopper. Moving the pump with a ***full hopper*** of concrete can cause ***severe damage*** or breakage of the axle and axle springs, excess strain and pressure on the hub and bearing assembly.



Leaking manifold seals or hose coupling gaskets which leak water can cause separation and subsequent jamming at that point.

REMIXTURES

Remixtures that are designed into the concrete mix by the redi-mix company or an architectural engineering company. This section lists common admixtures and a brief explanation of their functions:

A. **Pozzolith 300 –** or the equivalent acts as a water retarder and a lubricant. On a lean mix, long pushes, stiff mixes, and vertical pushes, Pozzolith 300R helps pumpability.

B. **MBVR –** air entraining, acts as a lubricant.

C. **Calcium Chloride –** commonly referred to as C.C., is used as an accelerator. When pumping a load with calcium chloride, it is recommended that you wash out if the waiting time between delivery trucks becomes too long.

D. **Super Plasticizers –** acts as an accelerator. The concrete will look very wet after the super plasticizer is added, but will begin to set up very fast. Wash out immediately if you do not have a truck waiting. Super plasticizers are used mainly on commercial jobs.

E. **Red Label –** acts as a water retarder and an accelerator. Red label will be used mainly on commercial jobs.

F. **Fly Ash –** is used to help increase the strength of the concrete and decrease the cement content per yard. This is one of the most common admixtures used.



All admixtures will be shown on the redi-mix concrete ticket. Before starting the pumping job, ask the driver of the redi-mix truck to see the concrete ticket and note the admixtures that exist and take the proper action.

DOWNHILL PUMPING

Downhill pumping can be a difficult procedure on some jobs. The slurry procedure would be the same as explained ***Priming The Pump With Slurry Mixture*** section of this manual. It is suggested that a sponge approximately 2"x 4"x 6" in size be placed in the hose before the start of pumping.

Wet the sponge before placing it in the hose to keep the slurry from running too far ahead of the concrete, which will reduce the possibility of separation. When the pump is stopped, the material can flow slowly down, due to gravity, and cause the hose to collapse.

When pumping is resumed, you can expect blockage at the point of hose collapse. To prevent this from happening, the hose can be "kinked off" at the discharge end when the pump is stopped to prevent the gravity flow of the material in the hose.

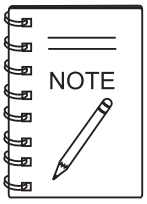
The use of stiffer mixes when pumping downhill will decrease gravity flow of the material in the hose and will assure a smoother operation between the cam roller bearing and cam plate. As with any job, make sure that the hose and the couplings are in good workable shape.

VERTICAL PUMPING

When pumping vertically up the side of a building, above 40 feet, we would recommend the installation of ***steel pipe*** securely fastened at intervals as necessary to support the pipe. Ninety degree, long radius pipe sweeps should be installed at the top and bottom of the steel line.

Use a 25 ft. hose, or short section, off the pump; and for the balance of the horizontal distance to the vertical line, use steel pipe. This type of installation has been satisfactory on many jobs being pumped in excess of 100 feet high. Line pressures are always less using steel pipe as compared to hose.

When pumping vertically, using ***all hose***, it is recommended not to go higher than 50 feet with hose. The hose should be tied off at intervals of 10 feet, if possible. Special attention should be given when tieing the hose off at the top as the hose will have a tendency to stretch when filled with concrete. This will increase the possibility of a blockage at the point where the hose is tied off. To avoid this, a long radius of 90º elbow is recommended. The suggested place to tie off is on the hose, under the clamp.



It is strongly recommended that ***steel pipe*** be used on all vertical pumping for safety and convenience.

HOSE PULSATION

A slight pulsation of the hose will always be noticeable near the pump. Excessive pulsation of the hose near the pump is normally due to higher than average line pressures caused by stiff, harsh mixes, or extremely long pumping distances.

The use of 2 -1/2" I.D. hose in these extreme cases reduces line pressures or the addition of slight amounts of water to the mix, if permissible, will permit easier pumping. The use of certain pumping admixtures may help.

If excessive pulsation exists in the hose, it is advisable to use burlap or some means of wear protection under the hose at points where the hose may wear through the outer cover; e.g. over forms, steel or sharp curbs.

SNAP-JOINT COUPLINGS

When using Snap-Joint couplings with gaskets to join hose, see that they are washed clean after each job. Keeping the hose ends clean (heavy duty) is very important for the best job setup. A thin coat of grease on the rubber gasket or dipping both coupling and gasket in water before coupling the hose will make for easier installation.

NEW PUMPS

All new pumps are 'water pressure tested" at the factory This procedure permits a thorough inspection of entire drive system and valving under simulated full load conditions. The pump owner can do the same by making an adapter to couple to the end of the discharge cone: e.g., the use of a standard 2" pipe cap with a 3/8" drilled hole in the center, screwed on to the end of hinged cone or reducer at the pump.

Fill the hopper with water after making sure that all sand and rock have been removed from manifold. Operate pump at full throttle and the 3/8" diameter hole restriction will create sufficient back pressure to make thorough inspection of all moving parts.

THE EFFECTS OF HEAT AND EXCESSIVE TIME ON CONCRETE:

Hot concrete, commonly referred to as a hot load, is concrete that has been in the redi-mix truck in excess of 2 to 3 hours. On a hot day, this amount of time is even less.

A brief explanation of why heat and time affect concrete:

Concrete starts setting by drying up through a chemical reaction. The catalyst to this reaction is heat. When pumping a hot load, it is important to remember that when you have to stop pumping for any reason, add water to the concrete in the hopper and hand mix and move concrete in the hose every 5 minutes. If the shut down time becomes too long, wash out ***immediately***.

If it is necessary to wait 1/2 hour or more for another load of concrete, to prevent setting of the mix in the system, it is advisable to consider the following factors (***A through D***) affecting the concrete:

A. How old is the concrete?

B. Is there an accelerator, calcium chloride, red label, etc., in the concrete?

C. The temperature of the day, 80, 90, degrees?

D. How much system you have out and how stiff was the mix you were pumping?

PREVENTING MIX SET-UP AFTER PUMP SHUTDOWN

When the pump is stopped for any reason during a pour; e.g., moving hose, waiting for redi-mix truck, the following suggestions are offered:

1. Leave the hopper full of concrete at the time of shut-down. It is important not to let the ***redi-mix*** driver wash too much water into the hopper, as this could cause separation of the concrete in the hopper.

2. If the ***shutdown*** period exceeds 2 to 3 minutes, turn off the engine so the vibration does not separate the mix in the hopper which can cause a blockage in the manifold when the pump is started.

3. If it is necessary to wait 10 minutes or more for another load of concrete, it is wise to start the pump and pump 6 or 8 strokes every 5 minutes to prevent setting of the mix in the system. If waiting time is excessive, it would be wise to wash out the pump and hoses and start over when the new truck arrives.

4. When pumping stiff mixes and there is waiting time between redi-mix trucks, it is advisable to add some water to the last hopper of material and "hand mix" to ensure an easier start with the following load.

5. When the pumping job requires a stiffer mix, the following method is suggested for starting: Take a water hose with a nozzle on it and apply water with a fine spray to the concrete as it comes down the redi-mix chute into the pump hopper after the slurry procedure is completed and you are ready to start pumping.

Using this procedure will make it easier to pump through the clean hose. Note: Once the concrete has reached the end of the hose, do not apply any more water in this manner as this procedure is used for starting only.

6. Hose sizing is very important: We strongly recommend on harsh mixes, vertical pushes, stiff concrete, shotcrete, long pushes, that a 2 -1/2" line be used as far as possible. The advantages of using the 2 -1/2" line are improved pumpability, less pumping pressure and less wear on the pump.

7. Following the pump operation, proper wash out of all materials or "build-up" within the pump manifold and hoses will prevent problems when starting the next job.

8. A thorough inspection of the drive components and greasing of all bearings after each job will ensure adequate lubrication and service to the pump which is normally operating in wet, gritty conditions.



Over-greasing any ***bearing*** on your Mayco pump will not damage the bearing.

CLEARING THE SYSTEM AFTER MIX SET UP

If, for any reason, the mix should set up in the system, the following procedure is suggested:

1. Disconnect the hose from the pump and wash the pump out immediately.

⚠ WARNING - HOSE/LINE PRESSURE

When disconnecting hoses, use **EXTREME CAUTION!** The hose is under pressure!

2 Reconnect the hose and fill the hopper with water.

3. Reconnect the hose and fill the hopper with water. **DO NOT** try to push all the concrete out of all of the hose lines at one time.

 For example: If you had 200 ft. of system out, you would disconnect each hose. Clean it out by pushing water through the first hose off the pump, then continue progressing through all the hoses, until all the system is clean.

4. If waiting time is excessive, it would be wise to wash out the pump and hoses and start over when the new truck arrives. This can be avoided by being observant to the pump and system, also taking into consideration the above actors (A through D) affecting the mix.

CLEARING CONCRETE BLOCKAGE

⚠ WARNING - BLOCKAGES

If you repeatedly pull the throttle all the way out and try to force your pump to push through ***blockages*** due to separation of material in the hose or manifold, you will soon have breakdowns and costly repairs which are not covered under warranty.

If a blockage occurs, find where it is and clear it before further pumping. **DO NOT** increase the engine speed to clear the blockage. Increasing the engine speed will only compound the problem.

If a blockage occurs in a hose, ***walk the hose*** until you find the point of trouble. The hose will be soft immediately past the blockage. To clear the blockage:

1. Disconnect the hose at the first coupling past the blockage.

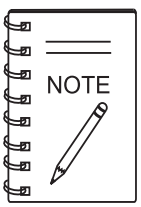
⚠ WARNING - HOSE LINE PRESSURE

Use extreme care! The hose line is under ***pressure*** and can cause serious injury.

2. Elevate the hose at that point with the blockage area hanging down.

3. Using a hammer, you can pound the downstream edge of the packed area until it is free to flow. Shake all of the sand and gravel out to the end of the hose.

4. Before reconnecting the hose, start the pump and run a small amount of concrete out to the end of the hose. This will assure that all of the separation is out of the hose.



Damaged hoses with internal restrictions can cause blockages.

CLEARING SHUTTLE TUBE BLOCKAGE

The shuttle tube is plugged if volume at the discharge end of the hose stops and the hydraulic oil pressure gauge reads 4400 PSI or more.

To clear a plug in the shuttle tube, great care must be taken as a dangerous condition will exist from pressure build-up inside the shuttle tube. (With the shuttle valve, the concrete can be pumped in reverse.) Use the following procedures to clear the shuttle tubes.

⚠ WARNING - SHUTTLE TUBES

DO NOT open any of the delivery system joint clamps.

"REVERSE" PUMPING PROCEDURE

A. Switch the pump into **REVERSE**. With pump speed at a medium-slow (approx. 12 strokes per min.) try to pull the "pack" back into the hopper with **5 or 6 reverse strokes**.

B. Remix the concrete in the hopper.

C. Switch the pump into **FORWARD**. If it is still plugged, repeat "Reversing" procedure three times.

If concrete still does not move, proceed to the Shuttle Tube Inspection Procedure.

⚠ WARNING - ACCUMULATOR PRESSURE

Make sure the accumulator pressure gauge reads **ZERO psi.** prior to performing any maintenance or inspection.You must follow lock out-tag out procedures.

SHUTTLE TUBE INSPECTION PROCEDURE

A. Stop the pump. Switch off the engine.

B The senior or most experienced operator must warn all others to stand at least **20 feet** away from the machine and turn their heads to face away from the pump.

C. The operator will position himself beside the reducing elbow at the pump outlet. Wearing ***safety glasses***, slip the end of a pry bar (24" length of reinforcing steel rod) under the latch of the hose clamp and flip it up.

D. Carefully knock the end of the hose away from the reducer.

E. Chip the concrete out of the reducer with the pry bar.

F. Remove the reducer. From the discharge end, chip the concrete out of the shuttle tube with the pry-bar. If concrete cannot be loosened from the outlet of the shuttle tube, remove the clean-out plug on the bottom of the hopper to discharge the concrete.

G. Chip the blockage out with the pry-bar.

H. Flush the shuttle tube with water.

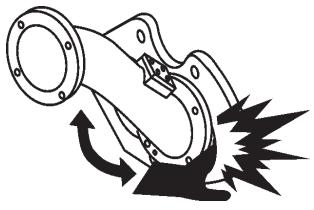
I. Before resuming operation of the pump, perform the "Reverse" Pumping Procedure to relieve pressure on the shuttle tubes.

TABLE 5. MAINTENANCE CHECK SCHEDULE						
	Daily	Hour-ly	Wee-kly	Month-ly	6-Mont-hs	Operational Hours
Engine Oil	X			X		
Engine Air Filter				X		
Fuel Filter				X		
Hydraulic Oil Level	X					500 hrs.
Lubrication Box		X				
Replace Hydraulic Oil						1000 hrs.
Clean Hydraulic Filters					X	500 hrs.
Axle Crank	X					2 hrs
Grease Shuttle Tube and Hopper Outlet Zerk Points						2 hrs
Check System Pressure			X			40 hrs.
Check Hardware for Tightness			X			40 hrs.
Check Cutting Ware Ring and Plate			X			
Check Trailer Brakes Function	X					
Check Brake Lights	X					
Check Tire Conditions	X					
Inspect Saftey Devices / Decals	X					
Check Wheel Bearings					X	
Check Battery				X		
Inspect Brake Lining					X	
Visually Check for Oil Leaks	X					

⚠ DANGER - AMPUTATION RISK

During routine maintenance or removing material blockage, you will be required to put your hand in the concrete cylinders or near the shuttle tube. You are at ***EXTREME RISK*** of injury or ***AMPUTATION*** if the engine is running or if pressure is in the hydraulic system.

Prior to performing any maintenance on the pump, follow described lock out-tag out procedures. Stop the engine by turning off the ignition switch and remove the starter key. Place a "**DO NOT OPERATE**" tag over the switch and disconnect the battery. The pressure reading on the accumulator pressure gauge ***MUST*** read **ZERO**. **ALWAYS** make sure the accumulator circuit pressure reads zero prior to performing any maintenance on the pump.



CLEANING THE PUMP AND DELIVERY SYSTEM

Cleaning the pump is a very important operation as it determines how the machine will pump the next time it is used.

At the end of every pour, or because of long delays during a pour, the pump and delivery system must be thoroughly cleaned by removing all concrete material.

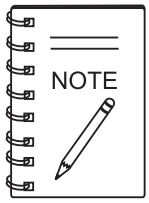
1. Following the **Clearing Concrete Blockage** operating procedure, ensure that there is no blockage in the hose and line or in the shuttle tube. If a blockage exists, clear it.
2. Pump concrete until the opening of the concrete cylinder intake in the hopper is visible.
3. Stop the pump.
4. Carefully disconnect the first hose joint at the shuttle tube discharge elbow.

5. Add water to the hopper. Pump and flush clean the entire hopper, shuttle tube and discharge elbow with water.
6. Scoop out 12 inches of concrete from the inboard end of the delivery hose. "Cork screw" a 6" x 6" x 8" sponge into the end of the first hose section. Reconnect the hose to the discharge elbow.
7. Fill hopper with water. Pump until sponge and clean water come out the discharge end of the hose and line system.
8. When the pump has been used to pump small aggregate concrete (pea rock, ½" minus) or mixes with high fines content (60% or more sand) there will be a tendency for hardened concrete to build up on the inside surface of the shuttle tube. Therefore, at the end of every such pour, after the pump and system have been cleaned and the engine shut off, remove all remaining concrete.
9. When the pump has been used to pump large aggregate concrete (" to 1 (" follow the instructions in step 8 once per week.

Deutz Model BF4L914 Diesel Engine

⚠ WARNING - ACID CLEANING

NEVER use muriatic acid to clean the pump. Acid will dissolve the chrome finish on material cylinder bore and main hydraulic cylinder rods.



Use only a 2½" diameter clean-out hook when back-pumping into redi-mix truck. Use a safety chain to secure the clean-out hook to some solid part of the mixer truck to prevent hook from jumping off of the drum. Run the pump at 6 strokes per minute maximum speed.

This pump is equipped with a Deutz BF4L914 turbo diesel engine. For information concerning the procedure in checking, removing, cleaning, etc. of the various engine parts or any other information on the engine not contained herein, refer to the engine manufacturer's instruction manual.

HYDRAULIC OIL SYSTEM MAINTENANCE

The Mayco pump is equipped with an in-tank return hydraulic filter with a 10 micron cleanable filter. The element has been designed to remove all particles large enough to cause wear and job break down. Under normal conditions, we recommend replacement every 6 month.

The most important factor to keep in mind is the effect of cold weather on the hydraulic oil. The viscosity (thickness) of the hydraulic oil will be much heavier.

ALWAYS run machine until oil temperature reaches a minimum of 50°F. before pumping. Damage to the main piston pump will occur if the machine is cycled too fast before the oil temperature reaches the minimum of 50°F. Cycle the machine at 6-8 strokes per minute at approximately 1/3 throttle.

In areas where the weather normally remains ***under 50°F***., use Shell Oil Tellus 46 (or the equivalent). The above steps must be followed or severe damage to the main axial piston pump can occur.

1. When changing the hydraulic oil or topping off the reservoir, use only the following type. (Reservoir capacity - 50 gal.)

Hydraulic oil: Shell Oil Tellius 68 or
Mobil DFE 26
Texaco Rand HDC

2. Lubrication: Grease daily/Hour

⚠ WARNING - HYDRAULIC OIL

DO NOT mix oil brands! This may impair quality.

(Recommended after each Pour)

- Main hydraulic cylinders - 2 Place
- Axle crank - 1 Place
- Shuttle cylinders - 2 Place
- "S" tube outlet flange - 3 Place

Grease Type: Lithium Based EP
Texaco Multitak 20
Lubriplate ED-2

BATTERY MAINTENANCE

⚠ CAUTION - BATTERY MAINTENANCE SAFETY

Wear ***safety glasses*** or ***face mask***, **protective clothes,** and **rubber gloves** when working with battery.





Mishandling of the battery shortens the service life of the battery and adds to maintenance cost. When handling the battery do the following:

- Be careful not to let the battery electrolyte come in contact with your body or clothing.
- Always wear ***eye protection*** and ***rubber gloves***, since the battery contains sulfuric acid which burns skin and eats through clothing.
- Always check the battery terminals periodically to ensure that they are in good condition.
- Use wire brush or sand paper to clean the battery terminals.
- Always check battery for cracks or any other damage. If white pattern appears inside the battery or paste has accumulated at the bottom, replace the battery.
- If the pump will not be in operation for a long period of time, store in cool dry place and check the battery charge level every month to maintain the performance of the battery.
- Check the battery regularly and make sure that each electrolyte level is to the bottom of the vent well (Figure 39). If necessary add only distilled water in a well-ventilated area.

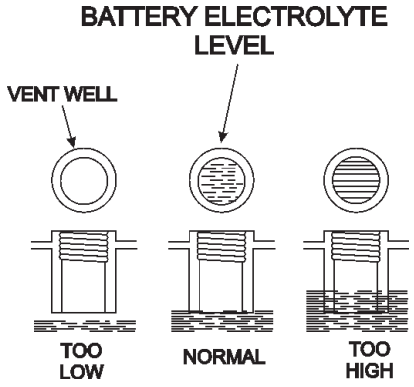


Figure 39. Battery Electrolyte Levels

BRAKE SYSTEM

The brake system should be periodically checked. Look for fluid leaks worn or cracked hoses. Check the reservoir for proper fluid levels. The Atwood surge brake should be checked for damage. Make sure that all links and pivots are kept lubricated.

1. Keep all links and pivots lubricated to prevent rusting and ensure ease of operation. Using SAE 30 oil, lubricate inside the release handle and inside the actuator body. This can be reached from the underside of the actuator.



Lubricate the hitch ball with conventional automotive grease or a lubricant made for hitch balls.

2. Check for any leaks in the brake system. Periodic checks should be made on all hoses to guard against cuts and worn hoses which may cause failure (leaks, rupturing under pressure, and collapsing). Replace defective hoses.

⚠ CAUTION - MASTER BRAKE CYLINDER

DO NOT fill the master cylinder reservoir with used brake fluid. **DO NOT** fill the reservoir beyond ½" from top. **DO NOT** overfill; brake fluid will damage paint.

3. Check the brake fluid level in the master cylinder reservoir. Keep it filled to within ½" from the top of the reservoir.
4. At the beginning of each year, inspect the brakes for excessive wear, replace the linings if necessary.



Wheel bearings and seals should be inspected and packed at this time.

CYLINDER LUBRICATION BOX

⚠ WARNING - FREEZING CONDITIONS

When using the pump during freezing conditions, completely drain the water box and cover the hopper after pumping. Frozen liquid will restrict the piston travel and cause ***severe damage*** to the pump.

⚠ CAUTION - SAFETY GUIDELINES

Before checking lubrication level, follow lock out-tag out procedures.Stop the engine and remove the engine starter key.

1. The lubrication level should be checked everyday prior to pumping and maintained at a height of 5 inches or about ½ the concrete cylinder height. We recommend using a 30-weight motor oil.
2. As the rubber piston cups naturally wear, fine cement particles will accumulate in the box. Once the concrete paste reaches a height of about ½ inch from the bottom of the box, drain and clean the lubrication box.

CLEANING THE LUBRICATION BOX

1. Remove the top cover and the drain plug (Figure 40) located at the bottom of the box and fully drain the inside of the box.
2. Once the box is drained, start the engine and stroke the cylinder (***keep hands out of box***) ten to fifteen times.
3. While stroking, spray water inside of the box to thoroughly clean out all contamination (Figure 40).
4. When the box is clean replace drain plug, add new lubrication and install the top cover.

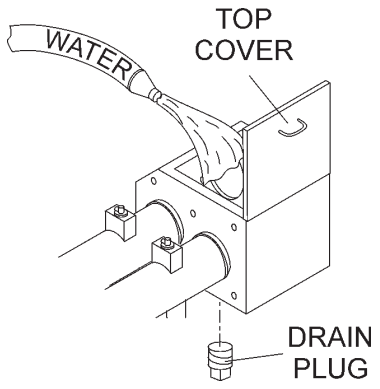
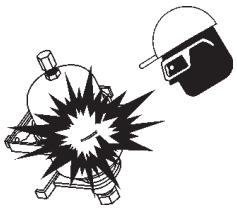


Figure 40. Cleaning the Lubrication Box

ACCUMULATOR CIRCUIT

⚠ DANGER - ACCUMULATOR CHARGING

Improper accumulator charging can result in an explosion causing serious injury or death! **NEVER** use oxygen or compressed air to charge the accumulator! Only qualified personal should perform this procedure. Use only ***dry nitrogen*** to charge the accumulator. Contact your Mayco service department or your local Hydac representative for proper charging procedure.



The accumulator circuit has two functions in the hydraulic system.

- The accumulator circuit furnishes the hydraulic pressure to cycle the shuttle tube.
- The accumulator circuit also furnishes the pilot pressure necessary to activate the hydraulic system.

The accumulator circuit is equipped with a bladder type accumulator (Figure 41) charged with **1100 PSI** of dry nitrogen. The accumulator stores one gallon of hydraulic oil, which is, under **1750 PSI** of pressure.

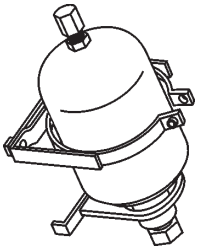


Figure 41. Accumulator

When the pump cycles, a part of the stored oil is released to the shuttle cylinder. This pressure release assures the shuttle tube has enough force to shear the cylinder of concrete passing from the concrete cylinder to the concrete delivery line during the cycle phase.

CHECKING ACCUMULATOR BLADDER PRESSURE

The normal accumulator charge pressure should be approximately **1100 PSI**. To check the accumulator pressure:

1. Start the engine and stroke the pump. The ***accumulator pressure gauge*** (Figure 30) should read **1750 PSI**.
2. To determine the **actual** accumulator PSI, stop the engine and observe the pressure gauge. As the PSI reading slowly decreases, it will reach a point where there will be a sudden drop in the PSI. The PSI reading should be taken just prior to this sudden drop. If you do not read 1100 PSI, the accumulator may require charging or bladder replacement.

WEAR PLATE AND CUTTING RING

Due to the abrasive nature of concrete, it is normal for the cutting ring to wear on its sides as it shears through the concrete inside the hopper. The metal-to-metal friction and the abrasiveness of the concrete will cause extreme wear and reduce sealing capability between the cutting ring and wear plate. If the two components do not properly seat against each other, slurry will pump into the hopper rather than out the discharge line. See Figure A. This condition can easily be observed:

1. The sudden change of the level of concrete inside the hopper during each pumping stroke
2. Concrete slurry squirting into the air from the hopper (Volcano effect)
3. When the output volume at the end of the delivery line decreases in pressure
4. Unusual frequent material packs in the Shuttle tube

It is important that the wear components be inspected weekly for proper sealing. Failure to inspect will eventually cause severe damage to the nun-plate and material cylinders. Visually inspect wear plate and cutting ring to ensure surfaces are sealed against each other. If a deep groove or a wide space has developed on the sealing surfaces, it is time for replacement.

Due to the motion of the Shuttle tube, the cutting ring experiences a quicker rate of wear as opposed to the wear plate. The wear ring typically requires replacement two times per wear plate (2 to 1). **When replacing the wear ring, also replace the rubber energizer ring.**

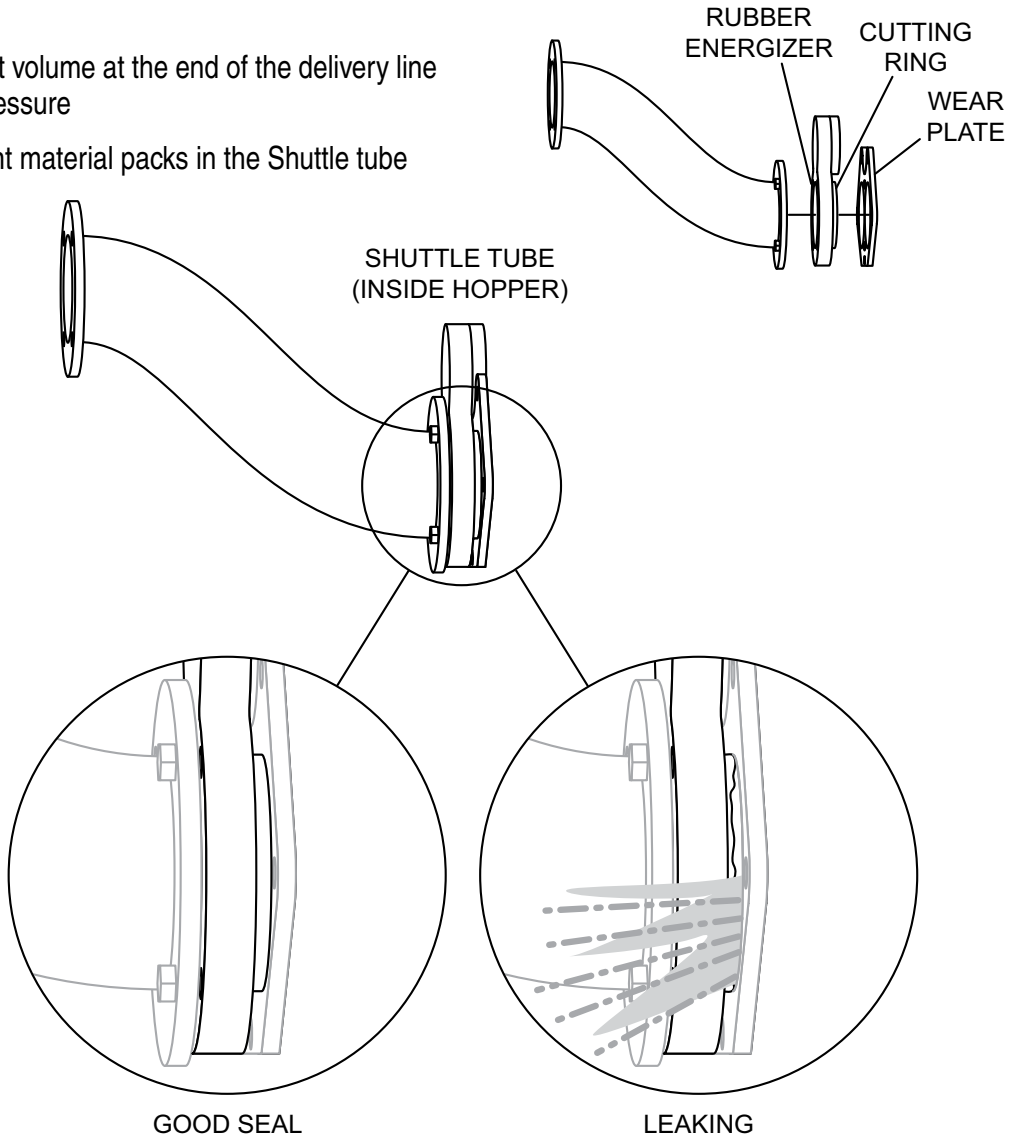


Figure A. Wear Plate and Cutting Ring

CHANGING THE CONCRETE CYLINDER PISTON CUPS

The Rubber piston cups will occasionally require replacement depending on the following factors.

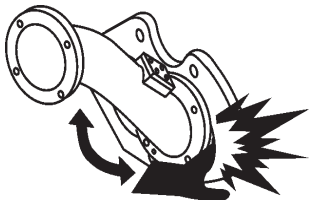
- The fluid level and cleanliness of the lubrication box.
- The size and type of aggregate.
- The type of concrete being pumped.

It is time to replace the cups when increasingly large particles of sand and cement pass into the lubrication box. Do not allow the cups to become so worn that they begin to pass lubrication into the material cylinders. If the liquid level of the lubrication box becomes to low, the rubber cups will severely deform due to excessive heat. Whenever replacement is due, both cylinder cups should be replaced.

⚠ DANGER - AMPUTATION RISK

During routine maintenance or removing material blockage, you will be required to put your hand in the concrete cylinders or near the shuttle tube. You are at ***EXTREME RISK*** of injury or ***AMPUTATION*** if the engine is running or if pressure is in the hydraulic system.

Prior to performing any maintenance on the pump, follow described lock out-tag out procedures. Stop the engine by turning off the ignition switch and remove the starter key. Place a "**DO NOT OPERATE**" tag over the switch and disconnect the battery. The pressure reading on the accumulator pressure gauge ***MUST*** read **ZERO**. **ALWAYS** make sure the accumulator circuit pressure reads zero prior to performing any maintenance on the pump.

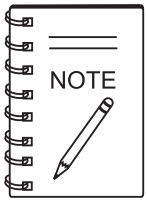


CYLINDER CUP REPLACEMENT PROCEDURE

1. Remove the two hydraulic hoses connected to the remix motor. Plug the ports with fittings (not provided) to prevent hydraulic hose leakage.
2. Remove the hopper discharge nipple and loosen sleeve seal. Inspect and replace if wear is excessive.
3. Remove the two tie rod nuts and the four eyebolt nuts securing the hopper to the pump frame.
4. Using an approved lifting device, remove the hopper using extreme care not to damage the hopper seal.
5. Start the engine and turn on the pressure test switch. Cycle pump in reverse until hydraulic system obtains maximum pressure, then turn pump and engine off.

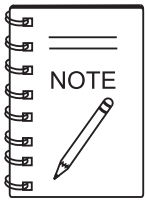
 Remove ignition key and disconnect battery. **Think safety!** Check the hydraulic gauges on panel and make sure accumulator pressure reads zero. One piston should be in the fully discharged position at the end of the concrete cylinder.

6. Remove the three 3/8 – 16 x 3" bolts from the piston. Remove the front faceplate.
7. Install two the 3/8' 16x3" bolts back into the piston – do not tighten. Use the two bolts as leverage to remove the rubber piston cup and rear components.
8. Obtain two 3/8 16x7" full thread studs (these studs will be used to assist in assembly alignment) insert the two studs into the piston adapter. Coat the concrete cylinder with grease.
9. Install the "O" Ring around the oiler plate. Install the plate into the concrete cylinder utilizing the studs for alignment.



Felt ring must be saturated with 30 wt. oil prior to installation.

10. Install the felt holder over the oiler plate. Install felt ring into felt holder. Install the bronze ring.
11. Using silicon sealant place a small bead of sealant material on the front of the rubber piston cup and the rear of the face plate. Install over alignment studs and into concrete cylinders.
12. Insert one 3/8" 16x3" bolt into the open bolt hole, remove the alignment studs one at a time and install the remaining 3/8" 16x3" bolts.



Before installing 3/8" bolt, coat the back of bolt heads with silicon sealant. Torque all three bolts equal at 55 ft. lbs. each.

CHANGING THE WEAR PLATE AND RING

Due to the swinging motion of the Nun-plate and the abrasive nature of concrete, it is normal for the cutting ring to wear on the side that shears through the concrete inside the hopper. If the wear ring and wear plate do not fully seat against each other the concrete slurry will pump into the hopper. This condition can be easily observed by the sudden change of the level of concrete inside the hopper during each stroke.

Wear Plate and Ring Replacement Procedure

1. Remove the two hydraulic hoses connected to the remix motor. Plug the ports with fittings (not provided) to prevent hydraulic hose leakage.
2. Remove the hopper discharge nipple and loosen sleeve seal. Inspect and replace if wear is excessive.
3. Remove the two tie rod nuts and the four eyebolt nuts securing the hopper to the pump frame.
4. Using an approved lifting device, remove the hopper using extreme care not to damage the hopper seal.
5. Remove the four 1/2" 1-¼" bolts that hold the shuttle tube to the nun-plate and remove shuttle tube.

 Using two small pry bars remove the rubber energizer ring, steel insert ring and wear ring.



The energizer ring and wear ring will normally have concrete contamination holding them in position. It will be required to chip some of the concrete loose to better expose the energizer ring.

6. Clean out all concrete build up in and around the nun-plate area with a wire brush.
7. Inspect the wear components for indications of wear. The wear plate has two wear surfaces.

Wear Plate Installation

1. Install the two cylinder "O" rings.
2. Using silicon sealant, coat the circumference of the concrete cylinders, the back of the wear plate and around the five bolt holes. Next, install the wear plate and the five bolts. The bolts must all be equally snugged and tightened to 100 foot pounds each.

Wear Ring installation

1. Install the wear ring into the nun plate.
2. Install the steel insert ring inside of the rubber energizer ring.
3. Install the energizer ring assembly into the nun-plate.

After installing the above mentioned components the machine can be reassembled by reversing steps 1 through 5 of the Wear Plate and Ring Replacement Procedure.

HEAT EXCHANGER COOLING FAN

This section is intended to make sure the fan is working properly. Under normal conditions the fan should be running any time the engine is turned on.

⚠ CAUTION - HYDRAULIC OIL TEMPERATURE

If the hydraulic oil temperature exceeds 170 degrees Fahrenheit, **shut down the pump**. **DO NOT** continue to operate the pump. Failure to shut down the pump will result in severe damage to the pump.

WHEEL BEARINGS

After every 6 months of operation inspect the wheel bearings. Once a year, or when required, disassemble the wheel hubs remove the old grease and repack the bearings forcing grease between rollers, cone and cage with a good grade of high speed wheel bearing greases (never use grease heavier than 265 A.S.T.M. penetration "No. 2.").

1. Fill the wheel hub with grease to the inside diameter of the outer races and also fill the hub grease cap.
2. Reassemble the hub and mount the wheel. Then tighten the adjusting nut, at the same time turn the wheel in both directions, until there is a slight bind to be sure all the bearing surfaces are in contact.
3. Back off the adjusting nut 1/6 to 1/4 turn or to the nearest locking hole or sufficiently to allow the wheel to rotate freely within limits of .001" to .010" end play. Lock the nut at this position.
4. Install the cotter pin and dust cap, and tighten all hardware.

EXTENDED STORAGE INSTRUCTIONS

The following preventative maintenance is recommended for extended periods of storage.

1. Check brake system for proper fluid level in master cylinder and bleed all lines.
2. Lubricate all links and pivots to prevent any rusting.
3. Remove wheel and drum assemblies and spray a good anti-corrosion compound (CRC formula 5-56) under rubber boot on forward end of brake wheel cylinder. Avoid spraying drum and brake lining.
4. Grease all bearings and reinstall wheel and drum assemblies.
5. Make sure breakaway cable is fully released.
6. After extended storage, refer to the Maintenance Steps listed above to insure that the trailer is ready for towing.

PRESSURE TEST

1. To determine the pressure of the Hydraulic System, set the ***Cylinder Stroke Control Switch*** (Figure 42) to the **JOG** position.

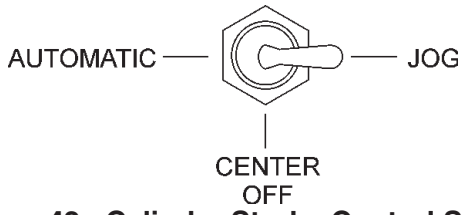


Figure 42. Cylinder Stroke Control Switch (JOG)

2. Turn and hold the **Manual Cylinder Jogging Switch** (Figure 43) to either **JOG "A"** or **JOG "B"** position to test the pressure of that cylinder.



Figure 43. Manual Cylinder Jogging Switch

13. The Pumping Pressure Gauge (Figure 44) should read approximately 4400 ± 50 PSI.

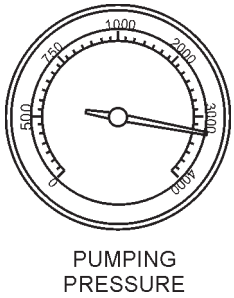


Figure 44. Pumping Pressure Gauge

The following trailer maintenance guidelines are intended to assist the operator in preventive maintenance.

Trailer Brakes

Properly functioning brake shoes and drums are essential to ensure safety. The brakes should be inspected the first 200 miles of operation. This will allow the brake shoes and drums to seat properly. After the first 200 mile interval, inspect the brakes every 3,000 miles. If driving over rough terrain, inspect the brakes more frequently.

Hydraulic Brakes

If your trailer has hydraulically-operated brakes, they function the same way the hydraulic brakes do on your tow vehicle. The hydraulic braking system must be inspected at least as often as the brakes on the tow vehicle, but no less than once per year. This inspection includes an assessment of the condition and proper operation of the wheel cylinders, brake shoes, brake drums and hubs.

Manually Adjusting the Brakes

Most axles are fitted with a brake mechanism that will adjust the brakes during a hard stop. However, some braking systems are not automatically adjusted by hard stopping. These brakes require manual adjustment. The following steps apply to adjust most manually adjustable brakes.

1. Jack up the trailer and secure it on adequate capacity jack stands.
2. Be sure the wheel and brake drum rotate freely.
3. Remove the adjusting-hole cover from the adjusting slot on the bottom of the brake backing plate.
4. With a screwdriver or standard adjusting tool, rotate the starwheel of the adjuster assembly to expand the brake shoes. Adjust the brake shoes out until the pressure of the linings against the drum makes the wheel very difficult to turn. Note: Your trailer maybe equipped with drop spindle axles. See axle manual for your axle type. You will need a modified adjusting tool for adjusting the brakes in these axles. With drop spindle axles, a modified adjusting tool with about an 80 degree angle should be used.
5. Rotate the starwheel in the opposite direction until the wheel turns freely with a slight drag.
6. Replace the adjusting-hole cover.
7. Repeat the above procedure on all brakes.
8. Lower the trailer to the ground.

You must check the fluid level in the master cylinder reservoir at least every three months. If you tow your trailer an average of 1,000 miles per month in a hot and dry environment, you must check the brake fluid level once a month. The brake fluid reservoir is located on the tongue of the trailer. Always fill with clean, uncontaminated DOT 4 brake fluid.

Figure 45 below displays the major hydraulic/air/surge brake components that will require inspection and maintenance. Please inspect these components as required using steps 1 through 6 as referenced in the "Manually Adjusting The Brakes" section on this page. See Table 11 Trailer Brake System Troubleshooting.

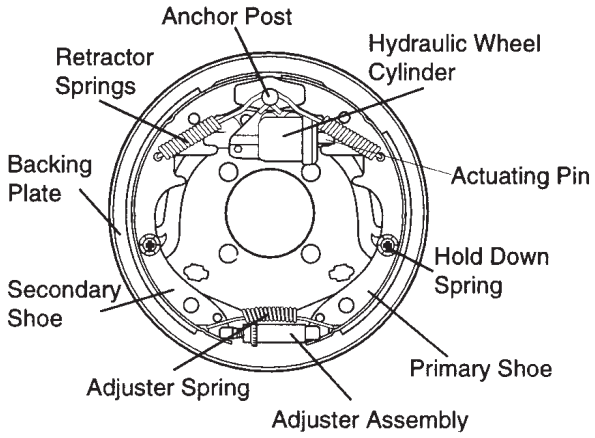


Figure 45. Hydraulic Brake Components

Hydraulic Brake Actuator

The hydraulic brake actuator (Figure 46) is the mechanism that activates the trailer's brake system. This actuator changes fluid power into mechanical power. Therefore, the fluid level must be checked frequently to assure that the brakes function properly.

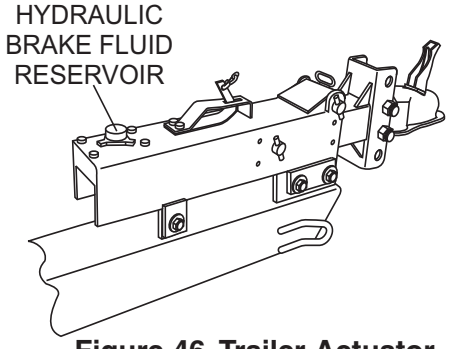


Figure 46. Trailer Actuator

⚠ WARNING - Actuator Fluid Level

Failure to maintain proper fluid level in the actuator may result in loss of braking action which could cause severe property damage, injury or death.

Periodically check the actuator mounting fasteners for damage or loosening. Inspect the actuator for worn or damaged parts. As you are towing your trailer, be aware of any changes in braking quality. This could be an early warning of brake or actuator malfunction and requires immediate attention. Consult a certified brake specialist to make necessary adjustment or repairs.

Adjustable Channel

Your trailer may be equipped with an adjustable channel (Figure 47) that allows the coupler to be raised or lowered to a desired height. Periodically check the channel bolts for damage or loosening.

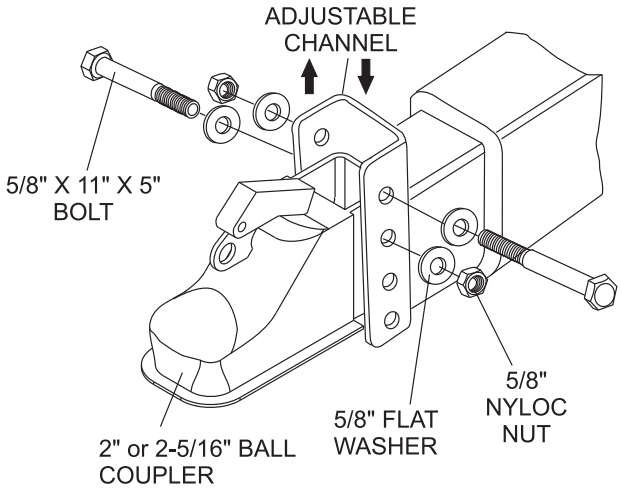


Figure 47. Adjustable Channel With Pintle Eye Coupler

Wheel Bearings (Hubs)

Wheel bearings (Figure 48) must be inspected and lubricated once a year or 12,000 miles to insure safe operation of your trailer.

If a trailer wheel bearing is immersed in water, it must be replaced.

If the pump/trailer has not been used for an extended amount of time, have the bearings inspected and packed more frequently, at least every six months and prior to use.

Follow the steps below to disassemble and service the wheel bearings.

- After removing the dust cap, cotter pin, spindle nut and spindle washer, remove the hub and drum to inspect the bearings for wear and damage.

⚠ DANGER - Wheel Bearings

If trailer wheels are under water for a long period of time, wheel bearings may fail. If this is the case, service wheel bearings immediately.

The possibility exists of the wheels falling off, causing equipment damage and severe bodily harm even death!

- Replace bearings that have flat spots on rollers, broken roller cages, rust or pitting. Always replace bearings and cups in sets. The inner and outer bearings are to be replaced at the same time.
- Replace seals that have nicks, tears or wear.
- Lubricate the bearings with a high quality EP-2 automotive wheel bearing grease.

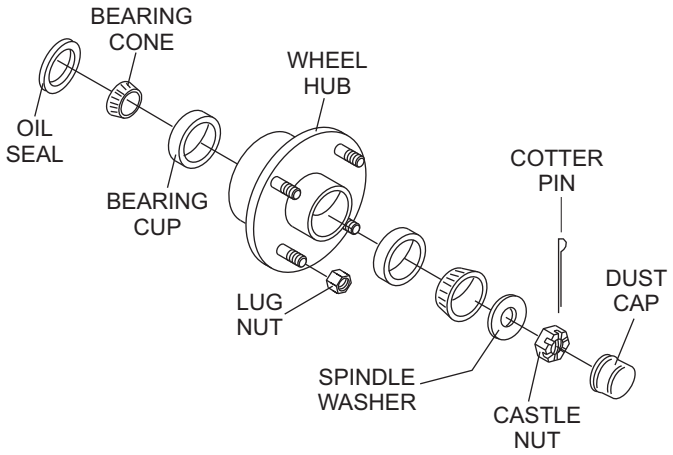


Figure 48. Wheel Hub Components

Wheel Hub Adjustment

Every time the wheel hub is removed and the bearings are reassembled, follow the steps below to check the wheel bearings for free running and adjust.

- Turn the hub slowly, by hand, while tightening the spindle nut, until you can no longer turn the hub by hand.
- Loosen the spindle nut just until you are able to turn it (the spindle nut) by hand. Do not turn the hub while the spindle nut is loose.
- Install a new cotter pin through the spindle nut and axle.
- Check the adjustments. Both the hub and the spindle nut should be able to move freely (the spindle nut motion will be limited by the cotter pin).

⚠ Danger - Raising the Trailer

NEVER crawl under the trailer unless it is on firm and level ground and resting on properly placed and secured jack stands.

The possibility exists of the trailer falling thus causing equipment damage and severe bodily harm even **death!**

⚠ DANGER - Trailer Inspection

When performing trailer inspection and maintenance activities, you must jack up the trailer using jacks and jack stands.

When jacking and using jack stands, place them so as to clear wiring, brake lines, and suspension parts (i.e., springs, torsion bars). Place jacks and jack stands inside of the perimeter strip on the supporting structure to which the axles are attached.

⚠ WARNING - Trailer Impact

If the trailer is involved in an accident have it inspected immediately by qualified personnel. In addition, the trailer should be inspected annually for signs of wear or deformations.

⚠ WARNING - Cracked or Broken Welds

Improper weld repair will lead to early failure of the trailer structure and can cause serious injury or death.

DO NOT repair cracked or broken welds unless you have a ***certified welder*** perform the repair. If not, have the welds repaired by your dealer.

⚠ Danger - Trailer Welds

Broken or damaged welds can cause injury or severe damage to your trailer and contents. Inspect all of the welds for cracks or failure at least twice a year.

Torsion Suspension

The mounting bracket (Figure 49) of the torsion suspension assembly is bolted directly to the trailer frame. Except for periodic inspection of the bracket's fasteners to the trailer frame, no other suspension maintenance is required on the axles.

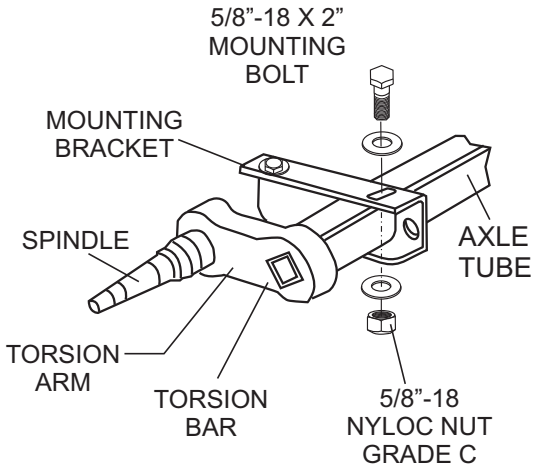


Figure 49. Torsion Suspension

⚠ Danger - Worn or Defective Suspension

Worn or broken suspension parts can cause loss of control, damage to equipment and severe bodily injury even ***death!***

Check suspension regularly.

TRAILER SAFETY INFORMATION

Safety precautions should be followed at all times when operating this equipment. Failure to read, understand and follow the Operating Instructions could result in injury to yourself and others. Loss of control of the trailer or tow vehicle can result in death or serious injury.

Common Causes for Loss of Trailer

- Driving too fast for the conditions (maximum speed when towing a trailer is 55 m.p.h.).
- Overloading the trailer or loading the trailer unevenly
- Trailer improperly coupled to the hitch
- No braking on trailer
- Not maintaining proper tire pressure
- Not keeping lug nuts tight
- Not properly maintaining the trailer structure.
- Ensure machine is towed level to tow vehicle.

Trailer Towing Guidelines

- Recheck the load tiedowns to make sure the load will not shift during towing.
- Before towing, check coupling, safety chain, safety brake, tires, wheels and lights.
- Check the lug nuts or bolts for tightness.
- Check coupler tightness after towing 50 miles.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance. Allow plenty of stopping space for your trailer and tow vehicle.
- Allow plenty of stopping space for your trailer and tow vehicle.
- **DO NOT** drive so fast that the trailer begins to sway due to speed.
- Allow plenty of room for passing. A rule of thumb is that the passing distance with a trailer is 4 times the passing distance without the trailer.
- Shift your automatic transmission into a lower gear for city driving.
- **ALWAYS** use lower gears for climbing and descending grades.
- **DO NOT** ride the brakes while descending grades, they may get so hot that they stop working. Then you will potentially have a runaway tow vehicle and trailer.
- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- **DO NOT** brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve and power through the curve. This way, the towing vehicle remains in charge.
- **DO NOT** apply the brakes to correct extreme trailer swaying. Continued pulling of the trailer, and even slight acceleration, will provide a stabilizing force.
- Anticipate the trailer "swaying." Swaying is the trailer reaction to the air pressure wave caused by passing trucks and buses. Continued pulling of the trailer provides a stabilizing force to correct swaying. **DO NOT** apply the brakes to correct trailer swaying.
- Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective.
- Be aware of your trailer height, especially when approaching roofed areas and around trees.
- Make regular stops, about once each hour. Confirm that:

A. Coupler is secure to the hitch and is locked.
B. Electrical connectors are secure.
C. There is appropriate slack in the safety chains.
D. There is appropriate slack in the breakaway switch pullpin cable.
E. Tires are not visibly low on pressure.

⚠ WARNING - Drive Safely

Driving too fast in severe road conditions can result in loss of control and cause death or serious injury.

Decrease your speed as road, weather and lighting conditions deteriorate.

ALWAYS check for local trailer-tow speed limits in your area.

⚠ CAUTION - Local Towing Regulations

Check with your county or state safety towing regulations department before towing your trailer.

Driving Conditions

When towing a trailer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). In addition, you will need a longer distance to pass, due to slower acceleration and increased length.

- Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a trailer, than driving a tow vehicle without a trailer.
- Check rearview mirrors frequently to observe the trailer and traffic.
- **NEVER** drive faster than what is safe.

⚠ WARNING - Transporting Personnel

DO NOT transport people on the trailer. The transport of people puts their lives at risk and may be illegal.

Coupling to the Tow Vehicle

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, equipment, and satisfactory life of the trailer. Always use an adequate tow vehicle and hitch. If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury.

If you already have a tow vehicle, know your vehicle tow rating and make certain the trailer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. If you already have (or plan to buy) a trailer, make certain that the tow rating of the tow vehicle is equal to or greater than that of the trailer.

The trailer VIN tag contains the critical safety information for the use of your trailer. Again, be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

⚠ WARNING - Coupler Selection/Condition

Proper selection and condition of the coupler and hitch are essential to safely towing your trailer. A loss of coupling may result in death or serious injury.

- Be sure the hitch load rating is equal to or greater than the load rating of the coupler
- Be sure the hitch size matches the coupler size
- Observe the hitch for wear, corrosion and cracks before coupling. Replace worn, corroded or cracked hitch components before coupling the trailer to the tow vehicle

Be sure the hitch components are tight before coupling the trailer to the tow vehicle.

⚠ WARNING - Coupler Connection

An improperly coupled trailer can result in death or serious injury.

DO NOT move the trailer until:

- The coupler is secured and locked to hitch
- The safety chains are secured to the tow vehicle
- The trailer jack(s) are fully retracted

DO NOT tow the trailer on the road until:

- Tires and wheels are checked
- The trailer brakes are checked
- The breakaway switch is connected to the tow vehicle
- The load is secured to the trailer
- The trailer lights are connected and checked

⚠ DANGER - Hitch/Tow Vehicle Load Rating

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

Reporting Safety Defects

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying us.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or us.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in the Washington D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, DC 20590. You can also obtain other information about motor vehicle safety from the Hotline.

Inoperable Brakes, Lights or Mirrors

Be sure that the brakes and all of the lights on your trailer are functioning properly before towing your trailer. Check the trailer taillights by turning on your tow vehicle headlights. Check the trailer brake lights by having someone step on the tow vehicle brake pedal while you look at trailer lights. Do the same thing to check the turn signal lights. (See Trailer Wiring Diagram section in this manual.)

Standard mirrors usually do not provide adequate visibility for viewing traffic to the sides and rear a towed trailer. You must provide mirrors that allow you to safely observe approaching traffic.

⚠ WARNING - Checking Taillights/Brakelights

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.

Before each tow:

- Check that the taillights, brake lights and turn signals work.
- Check that the electric brakes work by operating the brake controller inside the tow vehicle.

Trailer Towing Tips

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. Acceleration, maneuverability and braking are all diminished with a trailer in tow.

It takes longer to get up to speed, you need more room to turn and pass, and more distance to stop when towing a trailer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded trailer.

Because of the significant differences in all aspects of maneuverability when towing a trailer, the hazards and risks of injury are also much greater than when driving without a trailer. You are responsible for keeping your vehicle and trailer in control, and for all the damage that is caused if you lose control of your vehicle and trailer.

As you did when learning to drive an automobile, find an open area with little or no traffic for your first practice trailering. Of course, before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Also, before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and trailer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

Stop the rig a few times from speeds no greater than 10 mph. If your trailer is equipped with brakes, try using different combinations of trailer/electric brake and tow vehicle brake. Note the effect that the trailer brakes have when they are the only brakes used. When properly adjusted, the trailer brakes will come on just before the tow vehicle brakes.

It will take practice to learn how to back up a tow vehicle with a trailer attached. Take it slow. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles.

Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, "think" of the hands as being on the top of the wheel. When the hands move to the right (counterclockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left while backing up.

If you are towing a bumper hitch rig, be careful not to allow the trailer to turn too much because it will hit the rear of the tow vehicle. To straighten the rig, either pull forward or turn the steering wheel in the opposite direction.

Trailer VIN Tag

Figure 50 below is a sample of the Vehicle Identification Number (VIN) Tag which is typically located on the left front of the trailer. See Figure 51.

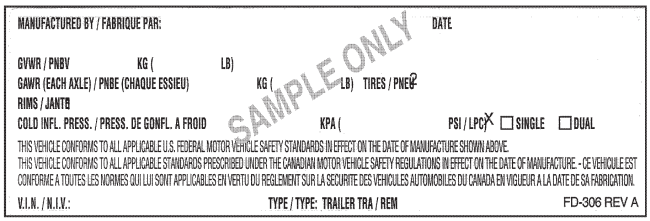


Figure 50. Vehicle VIN Tag

The trailer **VIN Tag** contains the following critical safety information for the use of your trailer.

GAWR: The maximum gross weight that an axle can support. It is the lowest of axle, wheel, or tire rating. Usually, the tire or wheel rating is lower than the axle rating, and determines GAWR.

GVWR: The maximum allowable gross weight of the trailer and its contents. The gross weight of the trailer includes the weight of the trailer and all of the items within it (such as the pump, and other items). GVWR is sometimes referred to as GTWR (Gross Trailer Weight Rating), or MGTW (Maximum Gross Trailer Weight). GVWR, GTWR and MGTW are all the same rating.

The sum total of the GAWR for all trailer axles may be less than the GVWR for the trailer, because some of the trailer load is to be carried by the tow vehicle, rather than by the trailer axle(s). The total weight of the cargo and trailer must not exceed the GVWR, and the load on an axle must not exceed its GAWR.

PSIC: The tire pressure (Pounds per Square Inch) measured when Cold.

VIN: The Vehicle Identification Number.

EMPTY WEIGHT: Some information that comes with the trailer (such as the Manufacturer's Statement of Origin) is not a reliable source for "empty" or "net" weight. The shipping documents list average or standard weights and your trailer may be equipped with options.

To determine the "empty" or "net" weight of your trailer, weigh it on an axle scale. To find the weight of the trailer using an axle scale, you must know the axle weights of your tow vehicle **without** the trailer coupled. Some of the trailer weight will be transferred from the trailer to the tow vehicle axles, and an axle scale weighs all axles, including the tow vehicle axles.

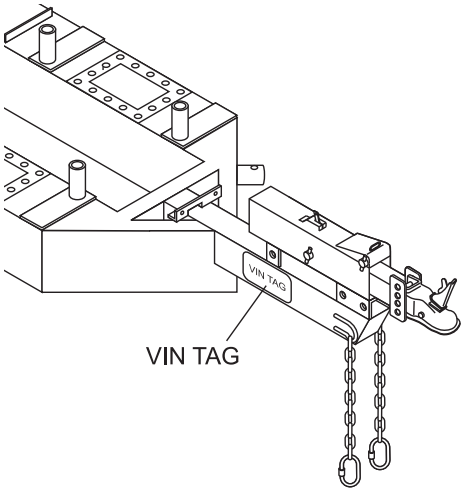


Figure 51. VIN Tag Location

Tow Vehicle

The towing hitch attached to your tow vehicle must have a capacity equal to or greater than the load rating of the trailer you intend to tow. The hitch capacity must also be matched to the tow vehicle capacity. Your vehicle dealer can provide and install the proper hitch on your tow vehicle.

Suspension System

Sway bars, shock absorbers, heavy duty springs, heavy duty tires and other suspension components may be required to sufficiently tow the trailer and pump.

Brake Controller

For trailers equipped with electric brakes, the electric brake controller is part of the tow vehicle and is essential in the operation of the electric brakes on the trailer. The brake controller is not the same as the safety breakaway brake system that may be equipped on the trailer.

Side View Mirrors

The size of the trailer that is being towed and your state law regulations determine the size of the mirrors. However, some states prohibit extended mirrors on a tow vehicle, except while a trailer is actually being towed. In this situation, detachable extended mirrors are necessary. Check with your dealer or the appropriate state agency for mirror requirements.

Heavy Duty Flasher

A Heavy Duty Flasher is an electrical component that may be required when your trailer turn signal lights are attached to the tow vehicle flasher circuit.

Electrical Connector

An Electrical Connector connects the light and brake systems on the trailer to the light and brake controls on the towing vehicle.

Emergency Flares and Emergency Triangle Reflectors

It is wise to carry these warning devices even if you are not towing a trailer. It is particularly important to have these when towing a trailer because the hazard flashers of your towing vehicle will not operate for as long a period of time when the battery is running both the trailer lights and tow vehicle lights.

Safety Chains

If the coupler connection comes loose, the safety chains can keep the trailer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the trailer from digging into the road pavement, even if the coupler-to-hitch connection comes apart.

Trailer Lighting (and Braking) Connector

A device that connects electrical power from the tow vehicle to the trailer. Electricity is used to turn on brake lights, running lights, and turn signals as required. In addition, if your trailer has a separate braking system, the electrical connector will also supply power to the brakes from the tow vehicle.

Breakaway System

If the trailer coupler connection comes loose, the breakaway system can actuate emergency electric or hydraulic brakes depending on the type of actuator on the trailer. The breakaway cable must be rigged to the tow vehicle with appropriate slack that will activate the system if the coupler connection comes loose.

Jackstand

A device on the trailer that is used to raise and lower the coupler. The jack is sometimes called the “landing gear” or the “tongue jack”.

⚠ WARNING

An improperly coupled trailer can result in death or serious injury.

DO NOT move the trailer until:

- The coupler is secured and locked to hitch;
- The safety chains are secured to the tow vehicle
- The trailer jack(s) are fully retracted.

DO NOT tow the trailer on the road until:

- Tires and wheels are checked;
- The trailer brakes are checked;
- The breakaway switch is connected to the tow vehicle;
- The load is secured to the trailer
- The trailer lights are connected and checked.

Coupler Types

The trailer is shipped from the factory with a 2-inch ball coupler.

Ball Hitch Coupler

A ball hitch coupler (Figure 52) connects to a ball that is located on or under the rear bumper of tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as "bumper pull."

A ball hitch trailer may be fitted with a tongue jack that can raise and lower the coupler. The tongue jack is mounted to the A-frame (front, or tongue) part of the trailer. By rotating the jack handle clockwise, the jack will extend and raise the tongue of the trailer.

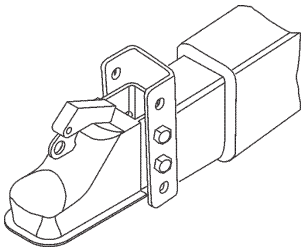


Figure 52. Ball Hitch Coupler Adjustable Tongue

Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation. Check the locking device that secures the coupler to the ball for proper operation.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ball or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

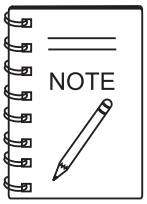
The coupler handle lever must be able to rotate freely and automatically snap into the latched position. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the ball socket and latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

The load rating of the coupler and the necessary ball size are listed on the trailer tongue. You must provide a hitch and ball for your tow vehicle where the load rating of the hitch and ball is equal to or greater than that of your trailer.

Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose or is worn, the trailer can come loose from the tow vehicle and may cause death or serious injury.

THE TOW VEHICLE, HITCH AND BALL MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER Gross Vehicle Weight Rating (GVWR). IT IS ESSENTIAL THAT THE HITCH BALL BE OF THE SAME SIZE AS THE COUPLER.

The ball size and load rating (capacity) are marked on the ball; hitch capacity is marked on the hitch.



When replacing a ball, the load rating must match or exceed the GVWR of the trailer.



Before coupling the tow vehicle to the trailer, be sure the size and rating of hitch ball match the size and rating of the coupler. Hitch balls and couplers are marked with their size and rating.

⚠ WARNING - Hitch Ball Load Rating

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the hitch ball is equal or greater than the load rating of the coupler.

Be sure the SIZE of the hitch ball matches the size of the ball coupler.

⚠ WARNING - Defective Hitch Ball

A worn, cracked or corroded hitch ball can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the hitch ball for wear, corrosion and cracks.

Replace worn or damaged hitch ball.

⚠ WARNING - Uncoupled Hitch Ball

A loose hitchball nut can result in uncoupling, leading to death or serious injury.

Be sure the hitch ball is tight to the hitch before coupling the trailer.

- Rock the ball to make sure it is tightened to the hitch, and visually check that the hitch ball nut is solid against the lock washer and hitch frame.
- Wipe the inside and outside of the coupler. Clean and visually inspect it for cracks and deformations. Feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is secured tightly to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.
- The bottom surface of the coupler must be above the top of the hitch ball. Use the tongue jackstand to support the trailer tongue. Wood or concrete blocks may also be used.

Coupling the Trailer to the Tow Vehicle (Ball Coupler)

- Lubricate the hitch ball and the inside of the coupler with a thin layer of automotive bearing grease.
- Slowly back up the tow vehicle so that the hitch ball is near or aligned under the coupler.
- Using the jackstand at the front of trailer (tongue), turn the jackstand crank handle to raise the trailer. If the ball coupler does not line up with the hitch ball, adjust the position of the tow vehicle.
- Open the coupler locking mechanism. Ball couplers have a locking mechanism with an internal moving piece and an outside handle. In the open position, the coupler is able to drop fully onto the hitch ball.

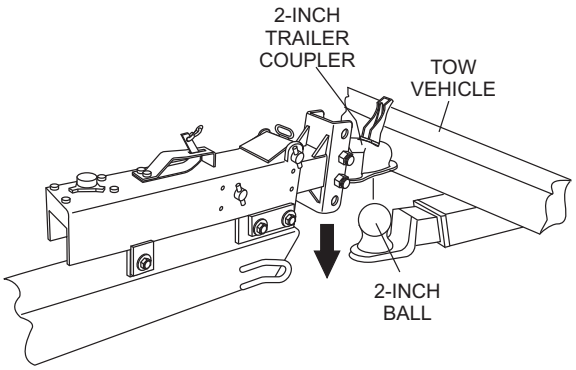
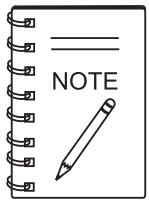


Figure 53. Ball Hitch Coupling Mechanism

- Lower the trailer (Figure 53) until the coupler fully engages the hitch ball.
- Engage the coupler locking mechanism. In the engaged position, the locking mechanism securely holds the coupler to the hitch ball.
- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the coupler is all the way on the hitch ball and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jackstand, verify that you can raise the rear of the tow vehicle by 1-inch after the coupler is locked to the hitch.
- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.



Overloading can damage the tongue jack. **DO NOT** use the tongue jack to raise the tow vehicle more than 1 inch.

If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call your dealer for assistance. Lower the trailer so that its entire tongue weight is held by the hitch and continue retracting the jack to its fully retracted position.

Attaching Safety Chain

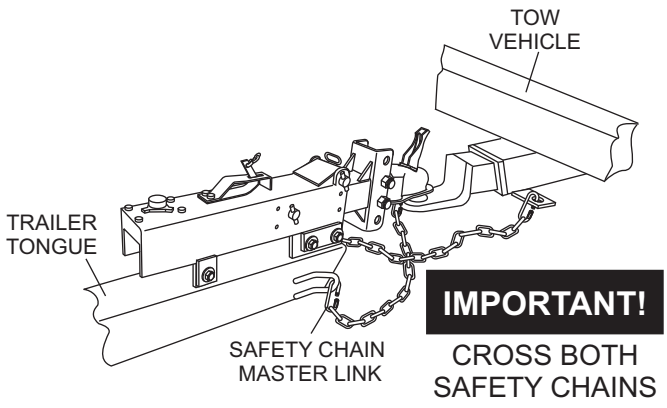


Figure 54. Safety Chain Arrangement for a Bumper Pull Trailer (Ball Hitch)

- Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.
- Attach the safety chains so that they:

A. Cross underneath the coupler. See Figure 54.

B. Loop around a frame member of the tow vehicle or holes provided in the hitch system (**DO NOT** attach them to an interchangeable part of the hitch assembly).

C. Have enough slack to permit tight turns, but not be close to the road surface, so if the trailer uncouples, the safety chains can hold the tongue up above the road.

⚠ WARNING - Safety Chains Rigging

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

- Fasten chains to frame of tow vehicle. **DO NOT** fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.
- ***Cross chains underneath*** hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.

Breakaway Brake System

If the coupler or hitch fails, a properly connected and working breakaway brake system (Figure 55) will apply the hydraulic brakes on the trailer. The safety chains will keep the tow vehicle attached and as the brakes are applied at the trailer's axles, the trailer/tow vehicle combination will come to a controlled stop.

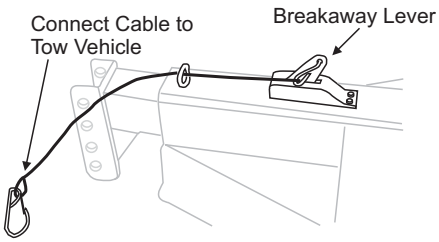


Figure 55. Breakaway Brake System

Breakaway Cable Surge Brake System

The breakaway brake system includes a brake cable connected to the tow vehicle on one end and to the emergency brake lever located on the hydraulic actuator on the other end.

⚠ WARNING - Brakeaway Cable

An ineffective breakaway brake system can result in a runaway trailer, leading to death or serious injury, if the coupler or ball hitch fails.

Connect the breakaway cable to the tow vehicle; and **NOT** to the hitch, ball or support.

Before towing the trailer, test the function of the breakaway brake system. If the breakaway brake system is not working, **DO NOT** tow the trailer. Have it serviced or repaired.

NOTE

DO NOT tow the trailer with the breakaway brake system **ON** because the brakes will overheat which can result in permanent brake failure.

NOTE

Replace the breakaway brake battery (if equipped) at intervals specified by manufacturer.

Connecting Trailer Lights

Connect the trailer lights to the tow vehicle's electrical system using the electric connectors at the front of the trailer (tongue). Refer to the wiring diagram shown in the trailer wiring diagram section of this manual. Before towing the trailer check for the following:

- Running lights (turn on tow vehicle headlights).
- Brake Lights (step on tow vehicle brake pedal).
- Backup Lights (place tow vehicle gear shift in reverse).
- Turn Signals (activate tow vehicle directional signal lever).

⚠ WARNING - Improper Electrical Connections

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.

Before each tow:

- Check that the taillights, brake lights and turn signals work
- Check that the electric brakes work by operating the brake controller inside the tow vehicle.

Uncoupling the Ball Hitch

Follow these steps to uncouple ball hitch from tow vehicle:

- Block trailer tires to prevent the trailer from rolling, before jacking the trailer up.
- Disconnect the electrical connector.
- Disconnect the breakaway brake switch cable. Promptly replace the pullpin in the switchbox.
- Before extending jackstand, make certain the ground surface below the jackstand foot will support the tongue load.
- Rotate the jackstand handle (or crank) clockwise. This will slowly extend the jack and transfer the weight of the trailer tongue to the jack.

TIRE SAFETY

Unsafe Tires, Lug Nuts or Wheels

Trailer tires and wheels are more likely to fail than car tires and wheels because they carry a heavier load. Therefore, it is essential to inspect the trailer tires before each tow.

If a tire has a bald spot, bulge, cuts, is showing any cords, or is cracked, replace the tire before towing. If a tire has uneven tread wear, take the trailer to a dealer service center for diagnosis.

Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate tracking on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes an unstable trailer and can result in a tire blowout and loss of control. Therefore, before each tow you must also check the tire pressure. Tire pressure must be checked when tires are cold.

Allow 3 hours cool-down after driving as much as 1 mile at 40 m.p.h. before checking tire pressure. NOTE: Trailer tires will be inflated to higher pressures than passenger vehicle tires.

Since trailer wheels and lug nuts (or bolts) are subjected to greater side loads than automobile wheels, they are more prone to loosen. Before each tow, check to make sure they are tight.

The proper tightness (torque) for lug nuts is listed in the lug nut tightening section of this manual. Use a torque wrench to tighten the lug nuts. If you do not have a torque wrench, use a lug wrench (from your tow vehicle) and tighten the nuts as much as you can. Then have a service garage or trailer dealer tighten the lug nuts to the proper torque.

⚠ WARNING - Lug Nut Tightening

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

Lug nuts are also prone to loosen after first being assembled. When driving a new trailer (or after wheels have been remounted), check to make sure they are tight after the **first** 10, 25 and 50 miles of driving and before each tow thereafter.

Failure to perform this check can result in a wheel parting from the trailer and a crash, leading to death or serious injury.

WARNING - Lug Nut Loosening

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

WARNING - Improper Lug Nut Torque

Improper lug nut torque can cause a wheel parting from the trailer, leading to death or serious injury.

Be sure lug nuts are tight before each tow.

WARNING - Tire Pressure

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on side wall before towing trailer.

Determining Load Limit of Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification/VIN label that is located on the forward half of the left (road) side of the unit. This certification/VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a the axle can weigh.

There is a vehicle placard (Figure 56) located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity.

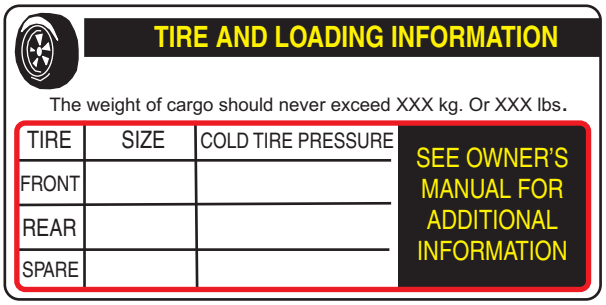


Figure 56. Tire and Loading Information Placard

If additional work items (hoses, tools, clamps etc.) are going to be added to the trailer, be sure they are distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification/VIN label and/or on the Tire and Loading Information placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

Step 1.

Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's Tire and Loading Information placard (Figure 56). This figure equals the available amount of equipment load capacity.

Step 2.

Determine the weight of the equipment being loaded on the tow vehicle. That weight may not safely exceed the available equipment load capacity. The trailer's Tire Information Placard is attached adjacent to or near the trailer's VIN (Certification) label at the left front of the trailer.

Determining Load Limit of Tow Vehicle

Step 1.

Locate the statement, "The combined weight of occupants and cargo should never exceed XXX lbs.," on your vehicle's placard.

Step 2.

Determine the combined weight of the driver and passengers who will be riding in your vehicle.

Step 3.

Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.

Step 4.

The resulting figure equals the available amount of cargo and luggage capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 650 lbs.).

Step 5.

Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in Step 4.

If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards and inspecting tires for cuts, slashes and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents.
- Improve fuel economy
- Increase the tire life

Use the information contained in this section to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

Tire Fundamentals

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires (Figure 57). This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

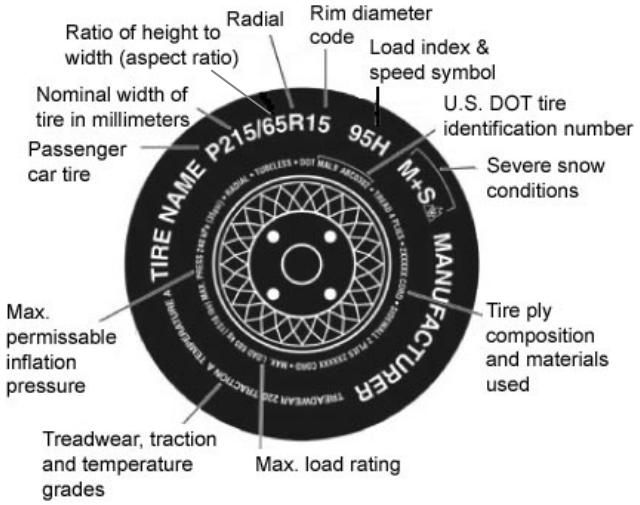


Figure 57. Standard Tire Sidewall Information

P: The "P" indicates the tire is for passenger vehicles.

Next number: This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number: This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

P: The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

Next number: This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

Next number: This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. Note: You may not find this information on all tires because it is not required by law.

M+S: The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

Speed Rating: The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed in Table 7. Note: You may not find this information on all tires because it is not required by law.

Table 6. Speed Rating

Letter Rating	Speed Rating
Q	99 mph
R	106 mph
S	112 mph
T	118 mph
U	124 mph
H	130 mph
V	149 mph
W	168* mph
Y	186* mph

U.S. DOT Tire Identification Number: This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used: The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum Load Rating: This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum Permissible Inflation Pressure: This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Uniform Tire Quality Grading Standards (UTQGS)

Treadwear Number: This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter: This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA","A", "B", and "C".

Temperature Letter: This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

Reference Figure 58 for additional tire information for light trucks.

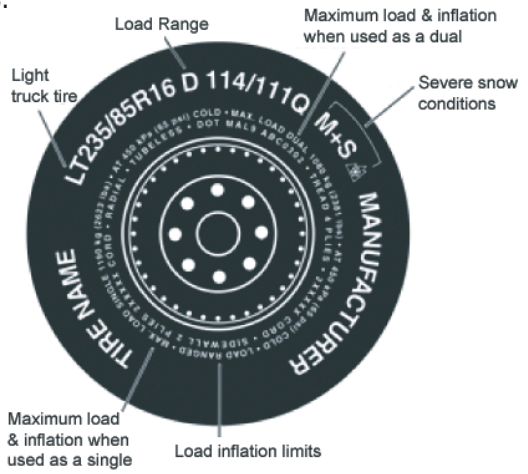


Figure 58. UTQGS Tire Information

Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT: The "LT" indicates the tire is for light trucks or trailers.

ST: An "ST" is an indication the tire is for trailer use only.

Max. Load Dual kg (lbs) at kPa (psi) Cold: This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

Max. Load Single kg (lbs) at kPa (psi) Cold

This information indicates the maximum load and tire pressure when the tire is used as a single.

Load Range

This information identifies the tire's load-carrying capabilities and its inflation limits.

Tire Safety Tips

- Slow down if you have to go over a pothole or other object in the road.
- **DO NOT** run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.
- Check tire inflation pressure weekly during use to insure the maximum tire life and tread wear.
- **DO NOT** bleed air from tires when they are hot.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- **ALWAYS** check tire pressure on tow vehicle and trailer before towing. Check tire pressure at least once a month.
- **DO NOT** overload tow vehicle. Check the tire information and loading placard for safe allowable tire loading conditions.

Tire Repair

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall ***should not be repaired***. Tires must be removed from the rim to be properly inspected before being plugged and patched.

Replacing Worn or Damaged Tires

Replace the tire before towing the trailer if the tire treads have less than 1/16 inch depth or the telltale bands are visible. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. A bubble, cut or bulge in a side wall can result in a tire blowout. Inspect both side walls of each tire for any bubble, cut or bulge; and replace a damaged tire before towing the trailer.

Table 8 below will help pinpoint the causes and solutions of tire wear problems.

TABLE 7 TIRE WEAR TROUBLESHOOTING

WEAR PATTERN		CAUSE	SOLUTION
	Center Wear	Over Inflation	Adjust pressure to particular load per tire manufacturer.
	Edge Wear	Under Inflation	Adjust pressure to particular load per tire manufacturer.
	Side Wear	Loss of chamber or overloading.	Make sure load does not exceed axle rating. Align wheels.
	Toe Wear	Incorrect toe-in	Align wheels.
	Cupping	Out-of balance	Check bearing adjustment and balance tires.
	Flat Spots	Wheel lockup & tire skidding.	Avoid sudden stops when possible and adjust brakes.

⚠ WARNING - Flying Objects



ALWAYS wear safety glasses when removing or installing force fitted parts **DO NOT** attempt to repair or modify a wheel. **DO NOT** install an inner-tube to correct a leak through the rim. If the rim is cracked, the air pressure in the inner tube may cause pieces of the rim to explode (break off) with great force and cause serious eye or bodily injury.

Wheel Rims

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

Wheels, Bearings and Lug Nuts

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check wheel bearings, jack trailer and check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. Most trailer axles are built with sealed bearings that are not serviceable. Sealed bearings must be replaced as complete units.



NEVER! use an pneumatic air gun to tighten wheel lug nuts.

⚠ WARNING - Lug Nut Tightening

Over-tightening lug nuts will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

⚠ WARNING - Lug Nut Inspection

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury. Check all wheel lug nuts periodically.

Lug Nut Torque Requirements

It is extremely important to apply and maintain proper wheel mounting torque on the trailer. Be sure to use only the fasteners matched to the cone angle of the wheel. Proper procedure for attachment of the wheels is as follows:

1. Start all wheel lug nuts by hand.
2. Torque all lug nuts in sequence. See Figure 59. **DO NOT** torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table 9.
3. Check to see if the lug nuts are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter.

TABLE 8. TIRE TORQUE REQUIREMENTS

Wheel Size	First Pass FT-LBS	Second Pass FT-LBS	Third Pass FT-LBS
12"	20-25	35-40	50-65
13"	20-25	35-40	50-65
14"	20-25	50-60	90-120
15"	20-25	50-60	90-120
16"	20-25	50-60	90-120

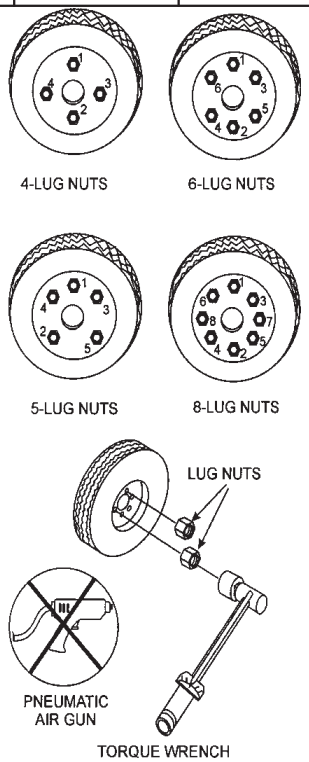


Figure 59. Wheel Lug Nuts Tightening Sequence

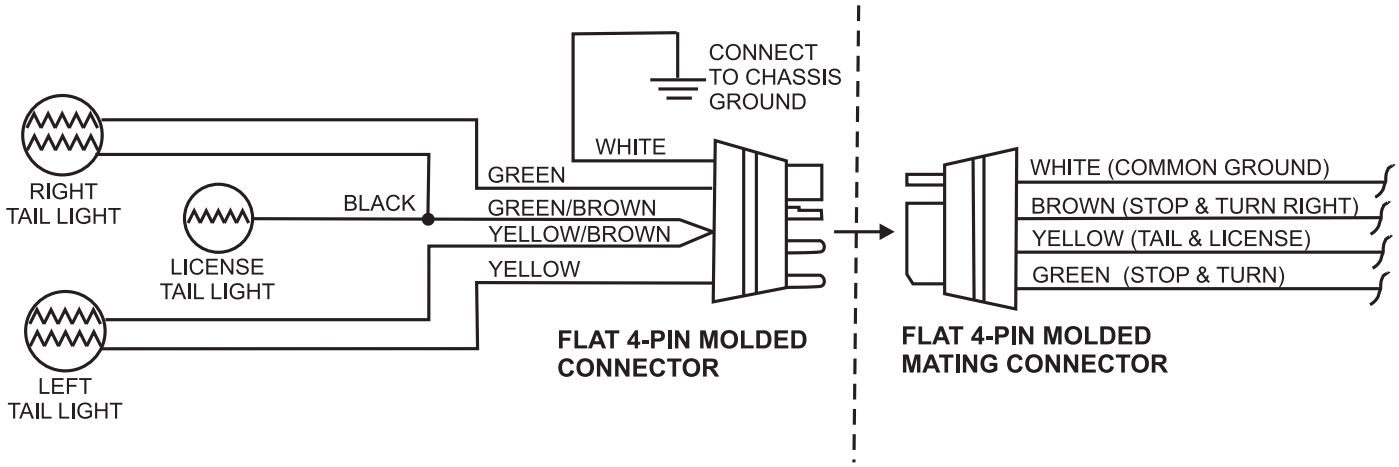


Figure 60. Trailer to Tow Vehicle Wiring Diagram

Lights and Signals

Before each tow, check the trailer taillights, stoplights, turn signals and any clearance lights for proper operation. Replace any broken or burned-out lamps as necessary. Check the wire harness for cuts, fraying or other damage. If it needs replacing, contact your dealer.

⚠ WARNING - Trailer Lights

Improper operating taillights, stoplights and turn signals can cause collisions.

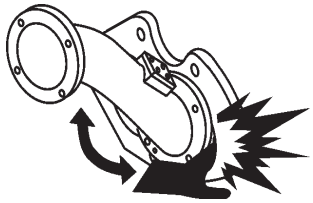
Check all lights before each tow.

The hydraulic troubleshooting procedures listed below are intended for use by individuals equipped with the proper tools and equipment and are familiar with hydraulic systems and safe shop practices. Use the Pump Troubleshooting Table (Table 8) to identify possible causes for the pump's malfunction. Contact the Multiquip Service department for the proper repair procedure.

⚠ DANGER - AMPUTATION RISK

During routine maintenance or removing material blockage, you will be required to put your hand in the concrete cylinders or near the shuttle tube. You are at ***EXTREME RISK*** of injury or ***AMPUTATION*** if the engine is running or if pressure is in the hydraulic system.

Prior to performing any maintenance on the pump, follow described lock out-tag out procedures. Stop the engine by turning off the ignition switch and remove the starter key. Place a "**DO NOT OPERATE**" tag over the switch and disconnect the battery. The pressure reading on the accumulator pressure gauge ***MUST*** read **ZERO**. **ALWAYS** make sure the accumulator circuit pressure reads zero prior to performing any maintenance on the pump.



⚠ WARNING - HYDRAULIC SYSTEM HAZARD

DO NOT open hydraulic lines or loosen hydraulic fittings while the engine is running! Hydraulic fluid under pressure can penetrate the skin, blind, cause burns or create other potentially dangerous hazards.

TABLE 9. PUMP TROUBLESHOOTING

Problem	Possible Problem	To Troubleshoot
Main Hydraulic Cylinder will not cycle	Incorrect System Operating Pressure	Check the pump pressure gage. Verify it is approx. 4400 PSI
	Incorrect Engine RPM setting	Verify the engine's high RPM speed is set to 2550
	Contaminated Main Relief Valve	Check the manifold for a contaminated Relief Valve
	Obstructed Material Cylinders	check for obstructions (dried material) inside the cylinders
Hopper Remix Paddles will not rotate	Incorrect Directional Control Operating Pressure	Verify the Directional Control operating pressure is approx. 1000 PSI
	Contaminated Relief Valve	Check the manifold for a contaminated Relief Valve
	Broken Shaft Coupler Key	Check the Hopper Remixer shaft coupler for a broken key
	Loose Shaft Retaining Set Collar	Check the Shaft Retaining Set Collar for tightness

TABLE 9. PUMP TROUBLESHOOTING (CONTINUED)		
Problem	Possible Problem	To Troubleshoot
Shuttle Cylinder does not stroke	Incorrect Accumulator System Pressure	Check the system pressure reading. Verify it is approx. 1750 PSI
	Contaminated Relief Valve	Check the manifold for a contaminated Relief Valve
	Swing Solenoid not energizing	Check for burned out solenoid and 12V signal voltage
	Swing Valve not functioning properly	Manually cycle the pump using the manual cylinder jogging switch
Shuttle Cylinder slow to complete stroke	Improper Flow Control setting	Fully open Flow Control Valve
	Incorrect Engine RPM setting	Verify the engine's high RPM speed is set to 2550
	Incorrect Main Hydraulic System Operating Pressure	Check the pump pressure gauge. Verify it is approx. 4400 PSI
	Contaminated Swing Relief Cartridge	Check the manifold for contaminated Swing Relief Cartridge
	Low Accumulator System Pressure	Check the accumulator pressure reading. Verify it is approx. 1750 PSI
	Hopper Discharge Nipple Seal improperly lubricated	Check the Hopper Discharge Nipple Seal for seizing and lack of lubricant
	Misaligned hopper creating excessive friction on the outlet nipple bearing sleeve	Realign hopper ensuring S-tube is rotating in the center of the hopper outlet.
	Lack of lubrication	Grease Nun Plate Bushing
Pump Engine will idle but not increase to full operating speed	Throttle Control Block Solenoid not energizing	Check for burned out solenoid and 12V signal voltage
Battery voltage falls below 12VDC on digital display, causing engine not to start	Blown out Fuse	Check the fuse
	Dead battery	Check the charge on the battery
	Wiring connection inside Control Box	Check the wiring connections and verify power is reaching ignition switch

TABLE 9. PUMP TROUBLESHOOTING (CONTINUED)

Problem	Possible Problem	To Troubleshoot
Main Hydraulic Pump Noisy	Insufficient oil	Check oil level and for closed suction strainer
	Air in system	Check for aeration reservoir
		Vacuum leak in suction line
	Excessive pump wear	Repair or replace
	Excessive engine speed	Check for correct engine RPM
Engine bogs down	Low engine speed	Check engine RPM
	Main relief cartridge set to low	Adjust relief cartridge
	Engine overloaded when pumping	Decrease volume control on main pump
		Material hose pack
Machine does not deliver volume and pressure	Low engine speed	Check engine RPM
	Volume control set to low	Adjust control to full open setting
	Main hydraulic pressure too low	Check for proper pressure or for contaminated relief cartridge
Hydraulic fluid gets hot	Cooling fan	Check fan electrical connection or for burnt fan motor.
		Fan rotating in wrong direction
	Contaminated cooler fins	Clean cooler fins
	Return filter element closed	Replace filter
	Main relief cartridge contaminated or set too low	Replace or set to proper pressure
	Hydraulic oil level too low	Fill to proper level
Accumulator gauge reads below 1750 PSI	Accumulator bottle low on notrogen	Check precharge pressure 1100 PSI
	Contaminated safety relief cartridge	Replace cartridge
	Defective unloader cartridge electrical coil	Replace
	Unloader cartridge coil not energizing	Check for 12 Volt signal voltage
	Defective gear pump	Replace pump
Concrete slurry in lubrication box	Worn or defective urethane cups or worn material cylinder	Replace
Material cylinder piston cups squeel	Low on lubrication	Check oil level
Cylinders not completely extended (short stroke)	Excessive amount of hydraulic on cylinder rod side	Inspect cylinder. Check values for contamination or faulty spring
	Hydraulic cylinder piston head seal leaking	Replace seals

LS600 PUMP — TROUBLESHOOTING (ENGINE)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Engine Troubleshooting (Table 9) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

TABLE 9. ENGINE TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Engine will not start or start is delayed, although engine can be turned over.	Speed control lever is in "STOP" position	Set speed control lever to "START" position.
	No fuel reaching injection pump	Add fuel. Check entire fuel system.
	Defective fuel pump	Replace fuel pump.
	Fuel filter clogged	Replace fuel filter and clean tank.
	Faulty fuel supply line	Replace or repair fuel line.
	Compression too low	Check piston, cylinder and valves. Adjust or repair per engine repair manual.
	Fuel injector not working correctly	Repair or replace injector in accordance with engine repair manual.
	Oil pressure too low	Check engine oil pressure.
	Low starting temperature limit exceeded	Comply with cold starting instructions and proper oil viscosity.
At low temperatures engine will not start.	Fuel separates has inadequate resistance to low temperatures	Check whether clear (not turbid) fuel emerges from the fuel line (detach from injection pump). If the fuel is turbid or separated, warm up the engine or drain the complete fuel supply system. Refuel with winter grade diesel fuel.
	Engine oil too thick	Refill engine crankcase with correct type of oil for winter environment.
Engine fires but stops soon as starter is switched off.	Throttle lever in STOP position	Reposition throttle lever to RUN position.
	Fuel filter blocked	Replace fuel filter.
	Fuel supply blocked	Check the entire fuel system.
Engine stops by itself during normal operation.	Fuel tank empty	Add fuel.
	Fuel filter blocked	Replace fuel filter.
Low engine power, output and speed.	Fuel tank empty	Replace fuel filter.
	Fuel filter clogged	Replace fuel filter.
	Fuel tank venting is inadequate	Ensure that tank is adequately vented.
	Speed control lever does not remain in selected position	See engine manual for corrective action.
	Engine oil level too full	Correct engine oil level?
Low engine power output and low speed, black exhaust smoke.	Air filter blocked	Clean or replace air filter.
	Incorrect valve clearances	Adjust valves per engine specification.
	Malfunction at injector	See engine manual.

LS600 PUMP — TROUBLESHOOTING (TRAILER BRAKE SYSTEM)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Brake System Troubleshooting (Table 10) information shown below and on the proceeding page. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

TABLE 10. BRAKE SYSTEM TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Brakes squeak, chatter or chuck.	Overheated wheel bearing	Replace wheel bearing and pack with grease.
	Low brake fluid	Fill and bleed brake system.
	Siezed acutator master cylinder	Replace/Rebuild master cylinder.
	Brake shoe noise	Inspect drums. Adjust shoes or replace if necessary.
Brakes overheah, fail to operate, pull to the side, or function poorly	Leaking wheel cylinder	Check and replace wheel cylinder and bleed brake system.
	Low brake fluid level	Fill with dot approved brake fluid and bleed brake system.
	Brake actuator frame damage	Replace complete actuator unit.
	Brake line being pinched	Replace brake line.
	Seized actuator	Replace or rebuild actuator.
	Broken return spring	Replace spring.
	Brakes improperly adjusted	Check adjustment.
	Break-away cable system partially activated	Break-away cable might be pulled. Determine cause and correct. Pry up on cable until indicator bead touches or rests against cable spring stop. This will fully release the frame brakes and prevent drag.

LS600 PUMP — TROUBLESHOOTING (ELECTRICAL)

Refer to Figure 61 for the location of components for troubleshooting.

TABLE 12. ELECTRICAL TROUBLESHOOTING

MALFUNCTION READING (*Screen 1*)	PROBABLE CAUSE	SOLUTION
MAIN A OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
MAIN A SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.
MAIN B OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
MAIN B SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.
SWING OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
SWING SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.

TABLE 12. ELECTRICAL TROUBLESHOOTING (continued)

MALFUNCTION READING (*Screen 1*)	PROBABLE CAUSE	SOLUTION
THROTTLE SOLENOID OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
THROTTLE SOLENOID SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.
FUEL SOLENOID OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
FUEL SOLENOID SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.
UNLOADER SOLENOID OPEN	Burnt 12 V cycling solenoid.	Measure solenoid coil resistance. It should read 6 ohms. Replace burnt solenoid.
	Wire connection broken.	Replace broken wire.
UNLOADER SOLENOID SHORTED	The 12-volt cycling solenoid is shorted directly to ground.	Measure solenoid coil resistance. It should read 6 ohms. Replace shorted solenoid.
	Wire connection is shorted directly to the ground.	Correct connection.
ALTERNATOR FAILURE	Defective alternator.	Replace alternator.
V-BELT BREAKAGE	Engine blower cooling fan V-belt is broken requiring replacement.	Replace v-belt.

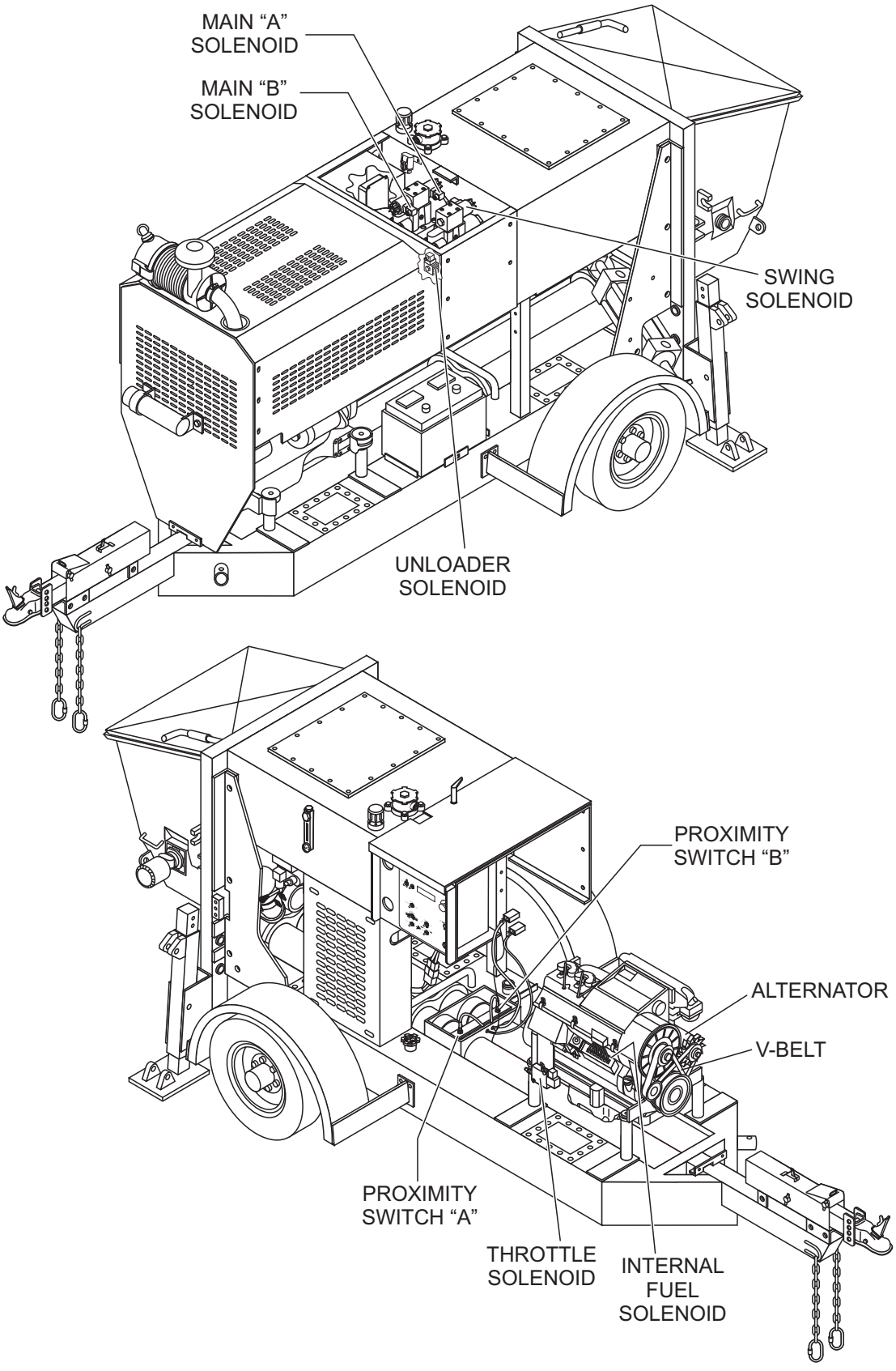


Figure 61. Location of Components for Electrical Troubleshooting

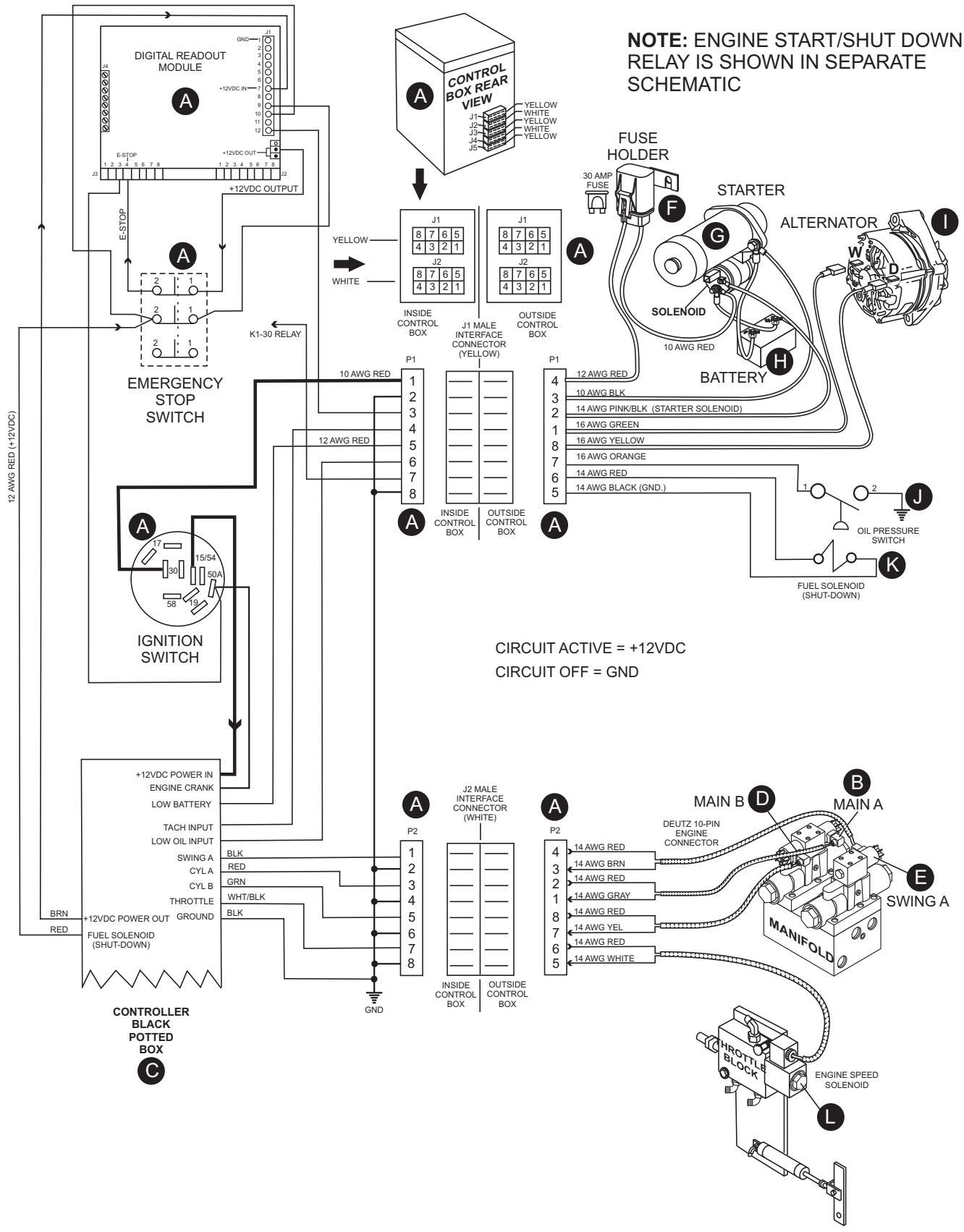


Figure 62. Connections to Digital Control Box - J1 and J2 Connectors (1 of 2)

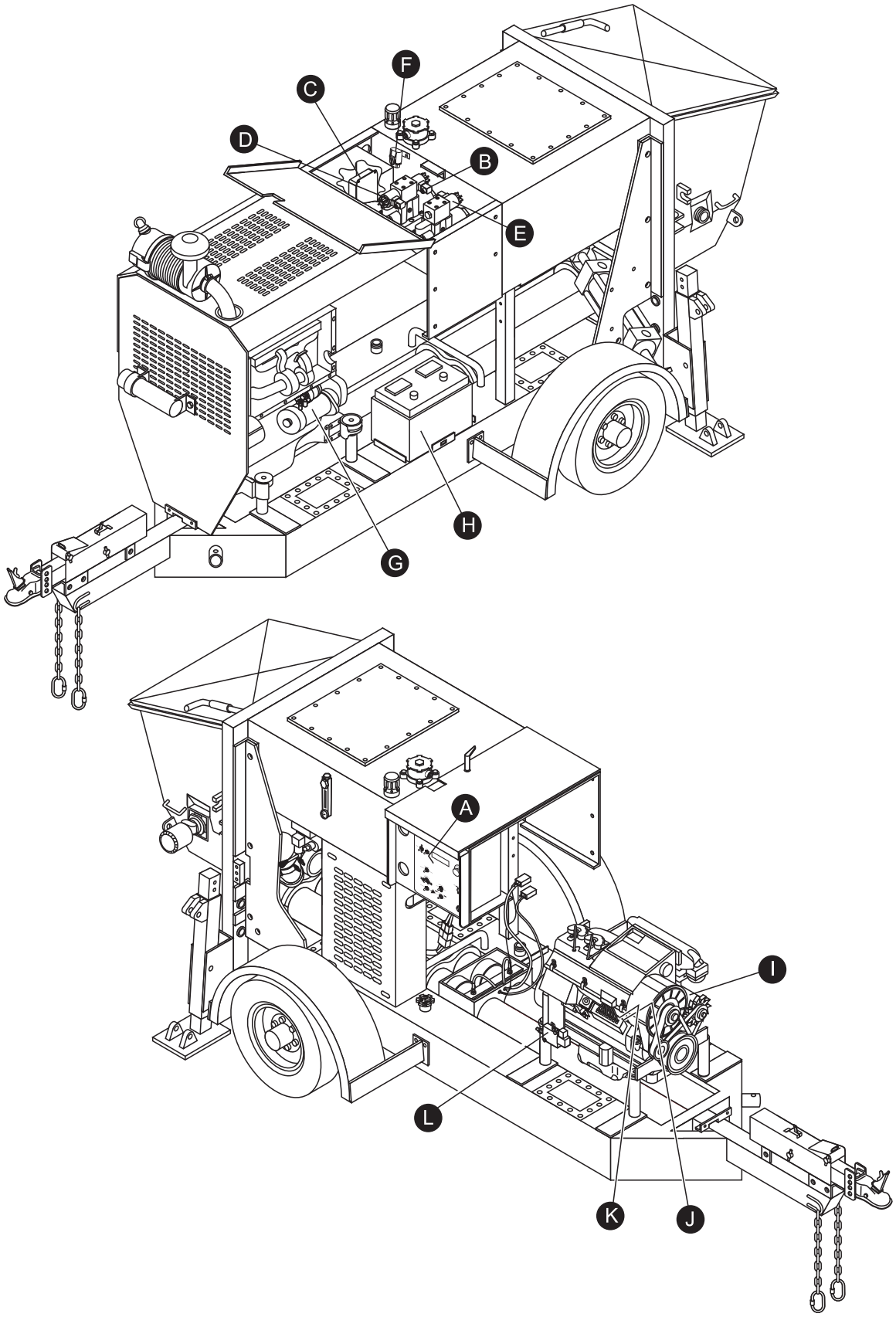
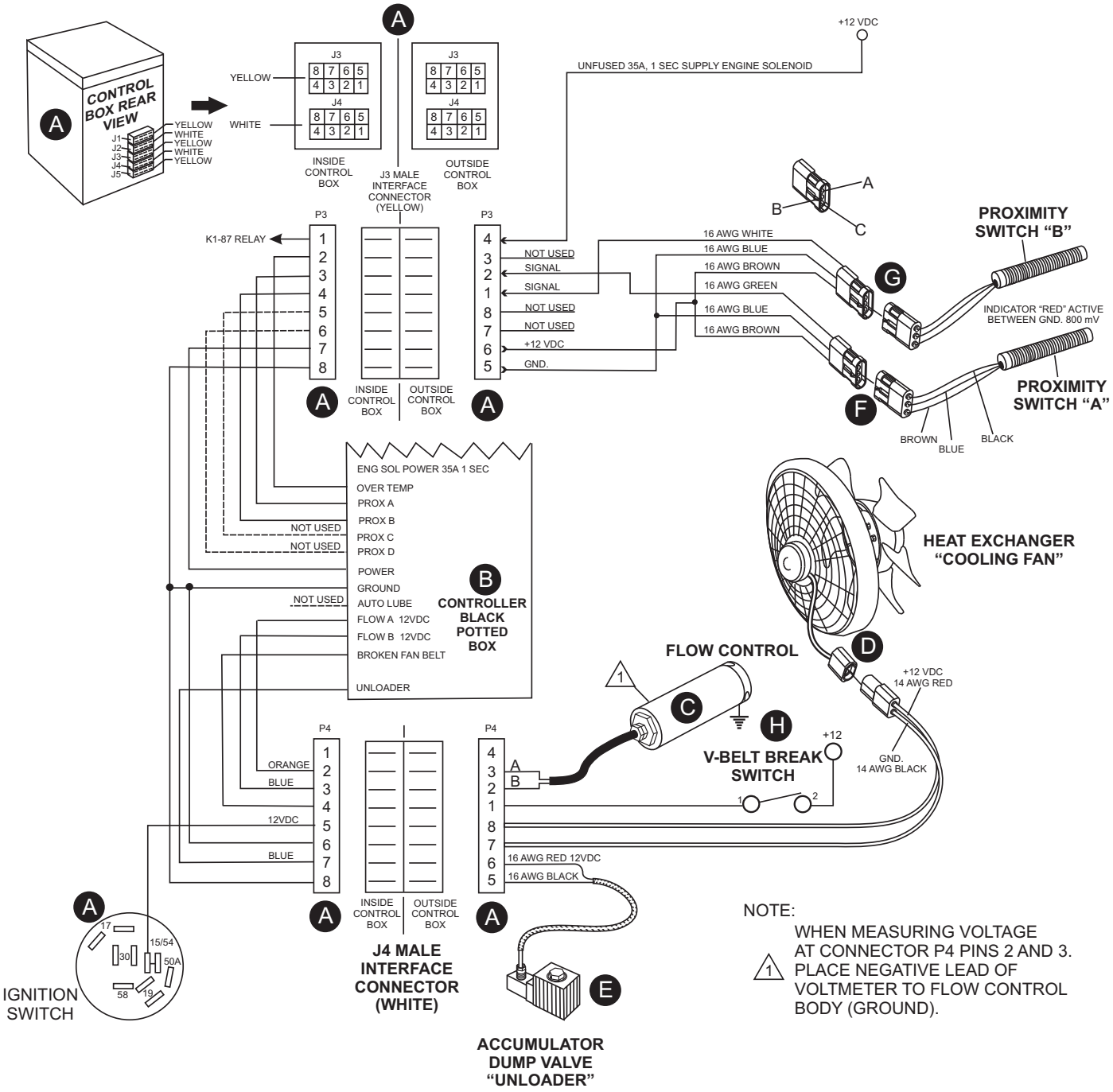


Figure 62. Connections to Digital Control Box - J1 and J2 Connectors (2 of 2)



NOTE:

1 WHEN MEASURING VOLTAGE AT CONNECTOR P4 PINS 2 AND 3. PLACE NEGATIVE LEAD OF VOLTMETER TO FLOW CONTROL BODY (GROUND).

CONNECTIONS TO J3 AND J4 CONNECTORS ON DIGITAL CONTROL BOX (LS600)

Figure 63. Connections to Digital Control Box - J3 and J4 Connectors (1 of 2)

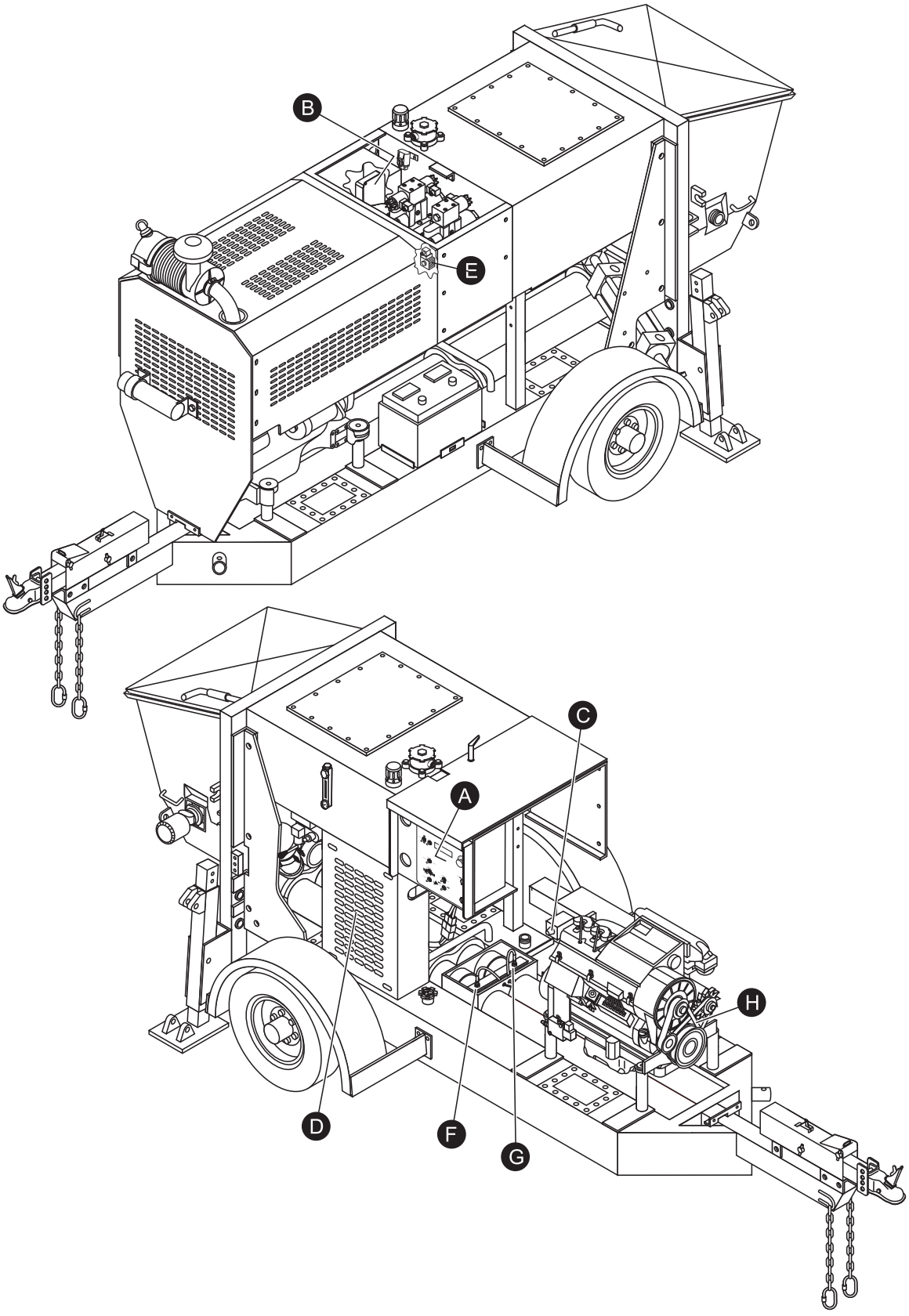


Figure 63. Connections to Digital Control Box - J3 and J4 Connectors (2 of 2)

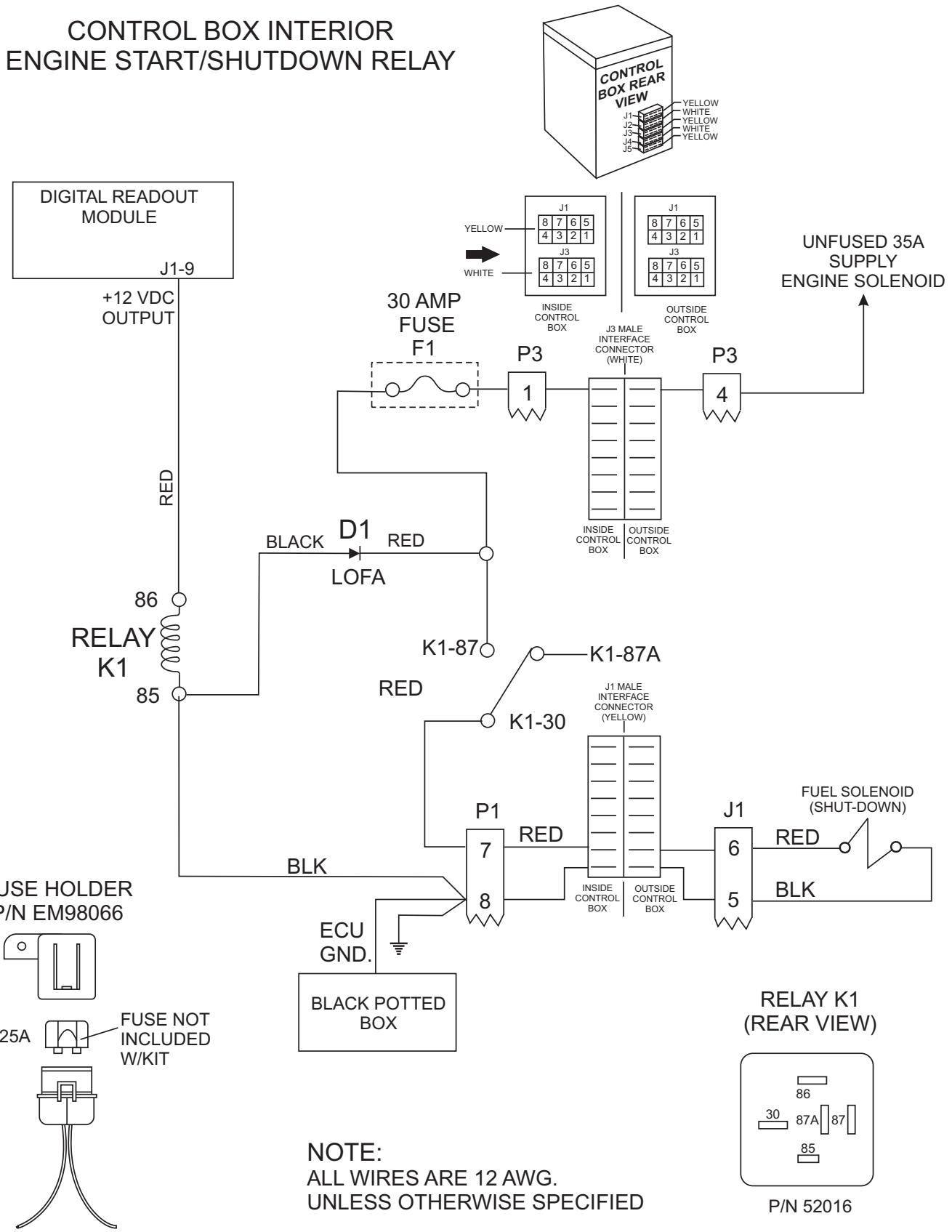
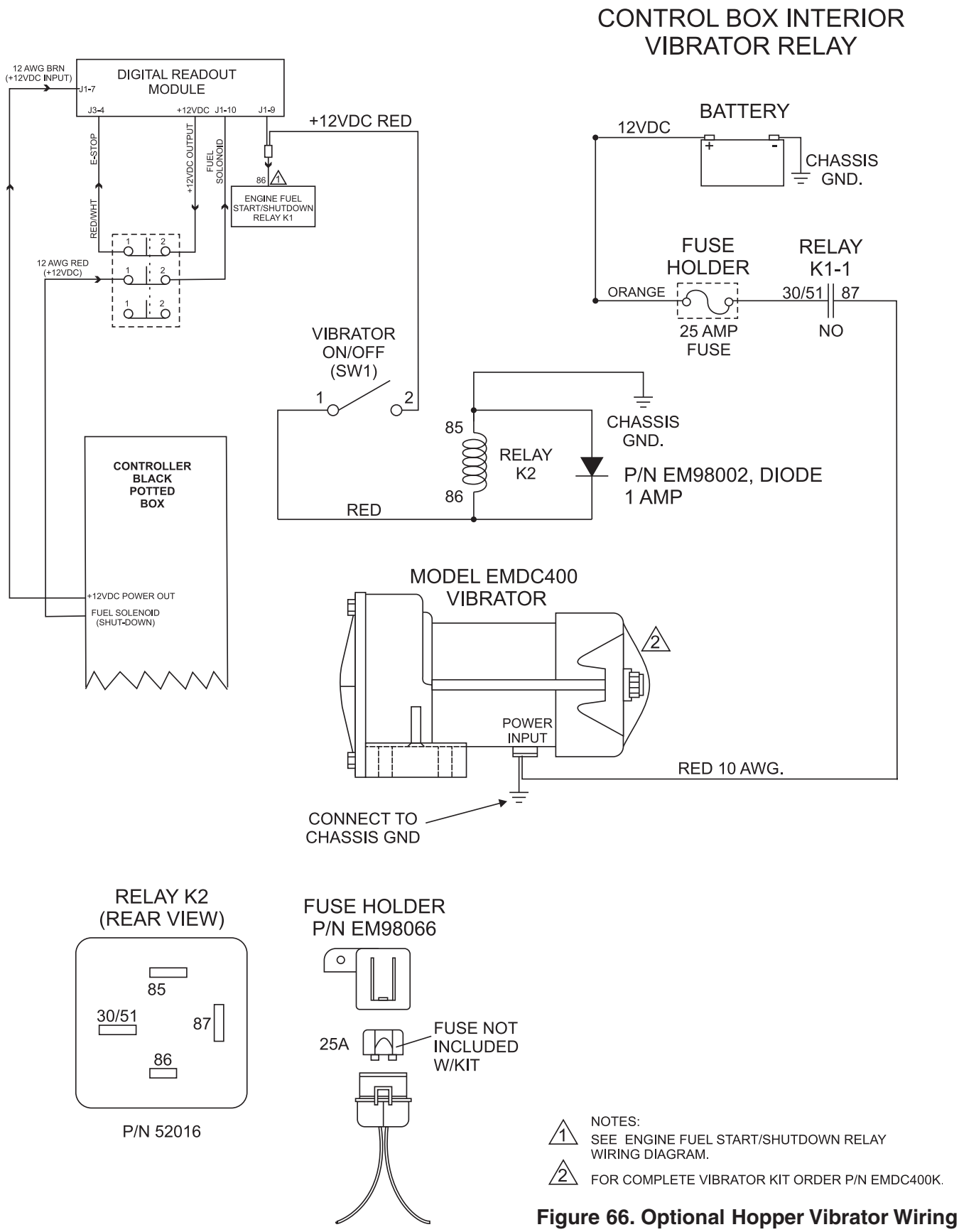


Figure 65. Engine Start/Shutdown Relay



NOTES:

1. SEE ENGINE FUEL START/SHUTDOWN RELAY WIRING DIAGRAM.
2. FOR COMPLETE VIBRATOR KIT ORDER P/N EMDC400K.

Figure 66. Optional Hopper Vibrator Wiring Diagram

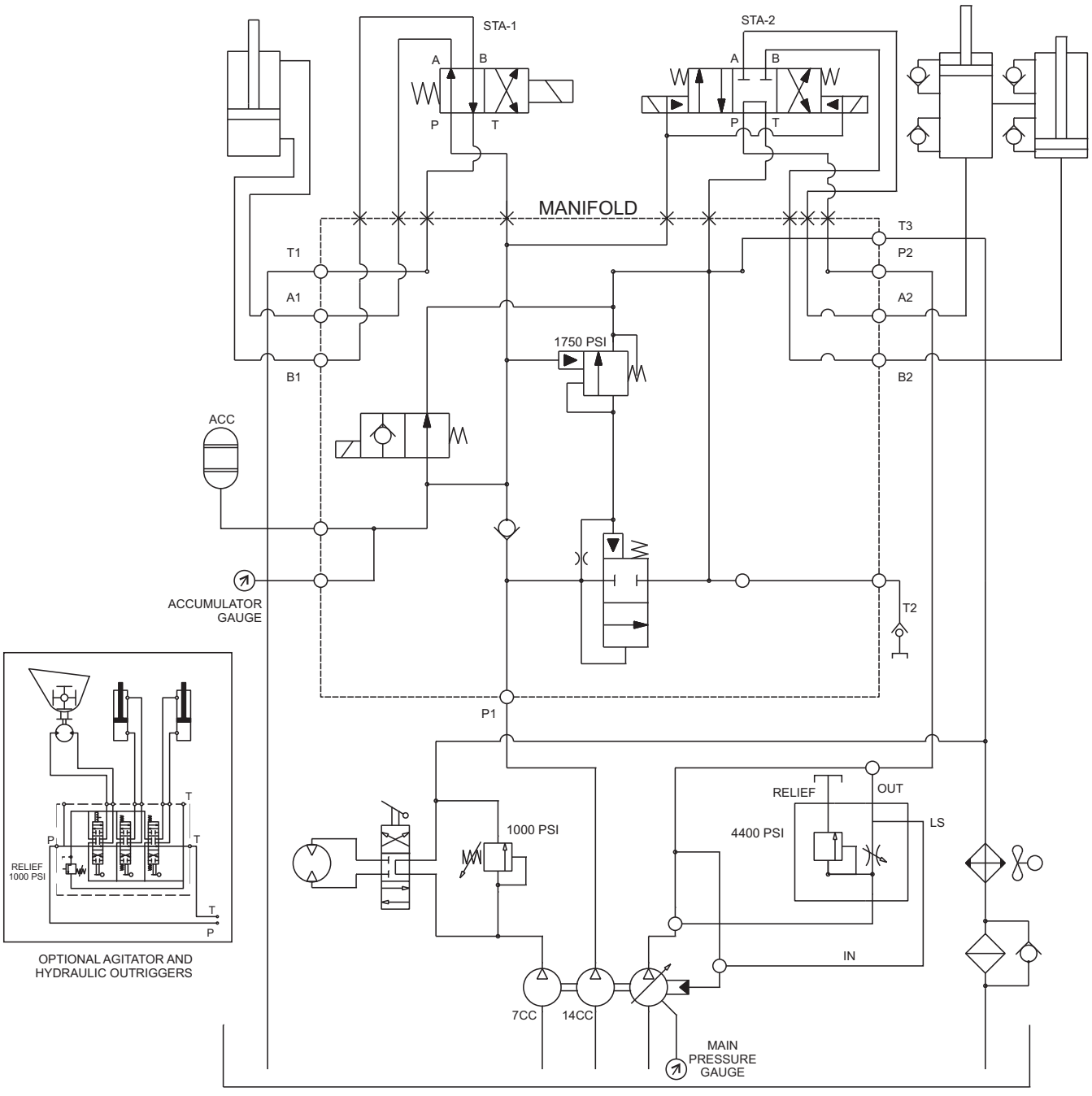
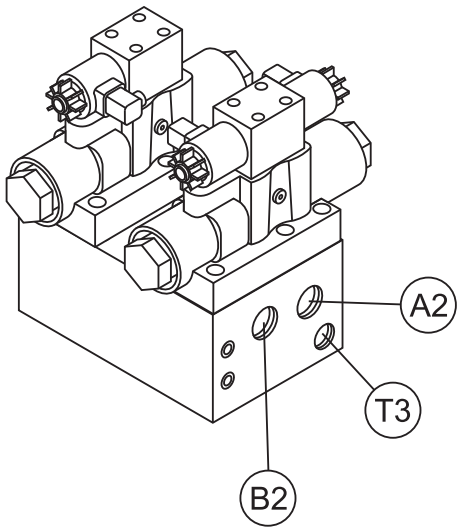
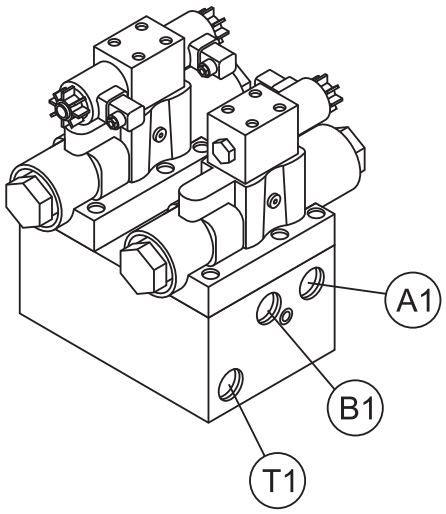


Figure 67. Hydraulic System Diagram





MANIFOLD BLOCK PORTS	
ACC	Connect to Accumulator Tank, Hose A
A1	Connect to Shuttle Cylinder, Hose T
A2	Connect to Hydraulic Cylinder, Hose I
B1	Connect to Shuttle Cylinder, Hose U
B2	Connect to Hydraulic Cylinder, Hose J
GA	Connect to Accumulator Gauge, Hose D
P1	Connect to Secondary Hyd. Pump, Hose E
P2	Connect to Flow Control Valve, Hose K
T1	Connect to Hydraulic Tank, Hose G
T2	Connect to Heat Exchanger, Hose L
T3	Connect to Tank, Relief Heat Exchanger, Hose H

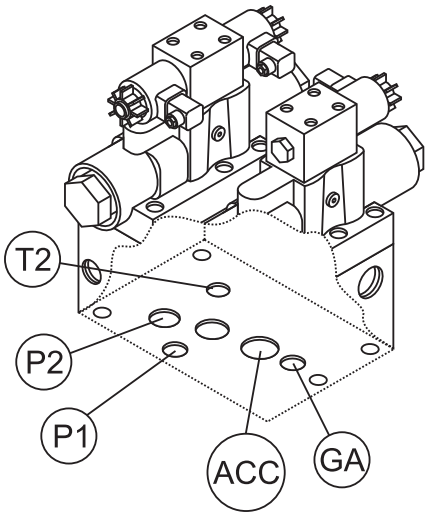


Figure 68. Manifold Block Ports

APPENDIX — CONCRETE MIX INFORMATION

The following information has been extracted from actual testing laboratory reports. The purpose of this printing is only to help create a better understanding of the importance of uniform gradation and proportioning of materials which affect pumpability of concrete mixes. These weights and proportions illustrate that when the sieve analysis is ideal, the sand/rock ratio can be adjusted (65% sand 35% rock) and pumpability should be excellent.

EXAMPLE #1 (A California Test Lab. Report)

JOB: Building Foundations (Water Project)

Sacks per cu./yd.	6.5 designed for 2,500 lbs. in 28 days
Gallons per sack	7.1
Washed Sand-#200 wash	1.3
Organic matter-OK	
Specific gravity (SSD)	Sand-2.58; Pea Gravel-2.60

Sieve analysis-percent passing

Material	1.5"	1"	3/4"	3/8"	#4	#8	#16	#30	#50	#100	#200
W.C. Sand				100	99.7	79.1	60.4	36.5	14.3	4.0	1.1
Pea Gravel				100	3.0						
% Comb.				100	66	51	39	23	9	3	1.0

DESIGN FOR ONE YARD OF CONCRETE (SATURATED & SURFACE DRY):

Absolute volume of aggregate in one cu. yard:	17.78 cu. ft.
Specific gravity of aggregates in one cu. yard:	2.58
Weight of aggregates in one cu. yard batch:	2850 lbs.

	%	BATCH	SPEC. GRAVITY		ABS. VOL.
W.C. Sand	65	1800	2.58	11.56	
PEA GRAVEL	35	1000	2.60	6.22	
WATER 46 gal.		1			
CEMENT 6.5 sk.		611			
TOTAL				27.00	
ADMIXTURE:		None			
SLUMP		4"			
REMARKS		This mix designed for pumping			
NOTE:		Due to the availability of well-graded sand as shown in the above sieve analysis, this mix pumped very successfully.			

A.S.T.M. STANDARD SPECIFICATION FOR GRADING AGGREGATE

SCREEN TYPE	U.S.	METRIC	PERCENTAGE PASSING BY WEIGHT
FINE AGGREGATE: Referred to as washed concrete sand.			
3/8” 	3/8”	9.50 mm	100%
#4 	4,760 microns	4.76 mm	95 to 100%
#8 	2,380 microns	2.38 mm	80 to 100%
#16 	1,190 microns	1.19 mm	50 to 85%
#30 	590 microns	.59 mm	50 to 85 %
#50 	297 microns	297µm	10 to 30%
#100 	149 microns	149µm	2 to 10%
3/8 (9.51 mm) PEA GRAVEL AGGREGATE: Referenced to as #4 Rock or Gravel or 1/2” minus (12.7 mm) size			
1/2” 	1/2”	12.70 mm	100%
3/8” 	3/8”	9.51 mm	85 to 100%
#4 	4,760 microns	4.76 mm	10 to 30%
#8 	2,380 micron	2.38 mm	0 to 10%
#16 	1,190 microns	1.19 mm	0 to 5%

1. To obtain a representative sample (concrete), take several samples at three or more regular intervals throughout the discharge of the mixer or truck. **DO NOT** take samples at the beginning or end of the discharge.

2. Dampen the inside of the cone and place it on a smooth, moist, nonabsorbent, level surface large enough to accommodate both the slumped concrete and the slump cone. Stand on the "foot pieces" throughout the test procedure to hold the cone firmly in place.

3. Fill the cone 1/3 full by volume (Figure 68-A) and rod 25 times with a 1/2" dia x 24" lg. bullet-pointed steel rod. (This is a specific requirement which will produce non-standard results unless followed exactly.) Distribute rodding evenly over the entire cross section of the sample.

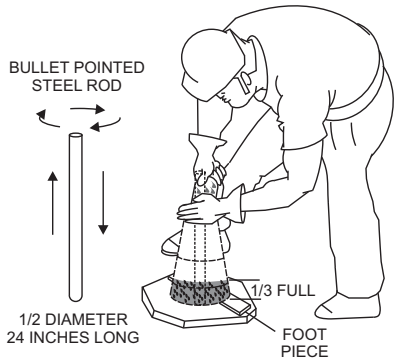


Figure 69-A. Slump Test (1/3 Full)

4. Fill cone another 1/3 (Figure 68-B) which will make the cone 2/3 full by volume. Rod this second layer 25 times with the rod penetrating into, but not through, the first layer. Distribute rodding evenly over the entire cross section of the layer.

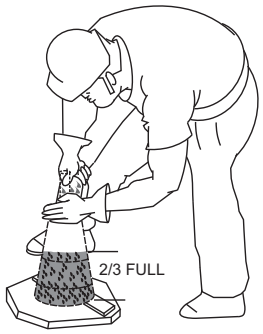


Figure 69-B. Slump Test (2/3 Full)

5. Fill cone to overflowing (Figure68-C). Rod this layer 25 times with rod penetrating into but not through, the second layer. Distribute rodding evenly over the entire cross section of this layer.

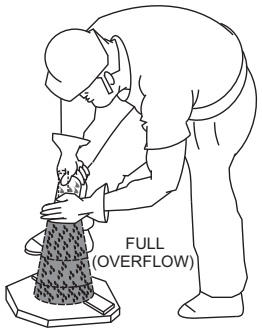


Figure 69-C. Slump Test (Full-Overflow)

6. Remove the excess concrete (Figure 68-D) from the top of the cone, using the tamping rod as a screed.



Figure 69-D. Slump Test (Removing Excess Concrete)

7. Lift the cone vertically (Figure 68-E) with a slow even motion. **DO NOT** jar the concrete or tilt the cone during this process. (Invert the withdrawn cone, and place it next to, but not touching the slumped concrete.

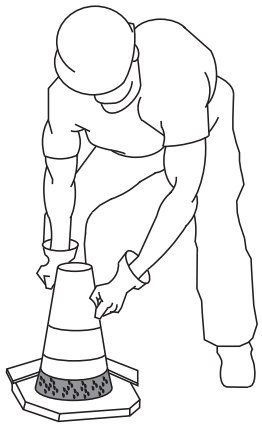


Figure 69-E. Slump Test (Cone Invert)

8. Lay a straight edge (Figure 68-F) across the top of the slumped cone. Measure the amount of slump in inches from the bottom of the straight edge to the top of the slumped concrete at a point over the original center of the base . The slump operation must be complete in a maximum elapsed time of 1-½ minutes. Discard the concrete. **DO NOT** use it in another tests.



Figure 69-F. Slump Test (Measurement)

NOTES

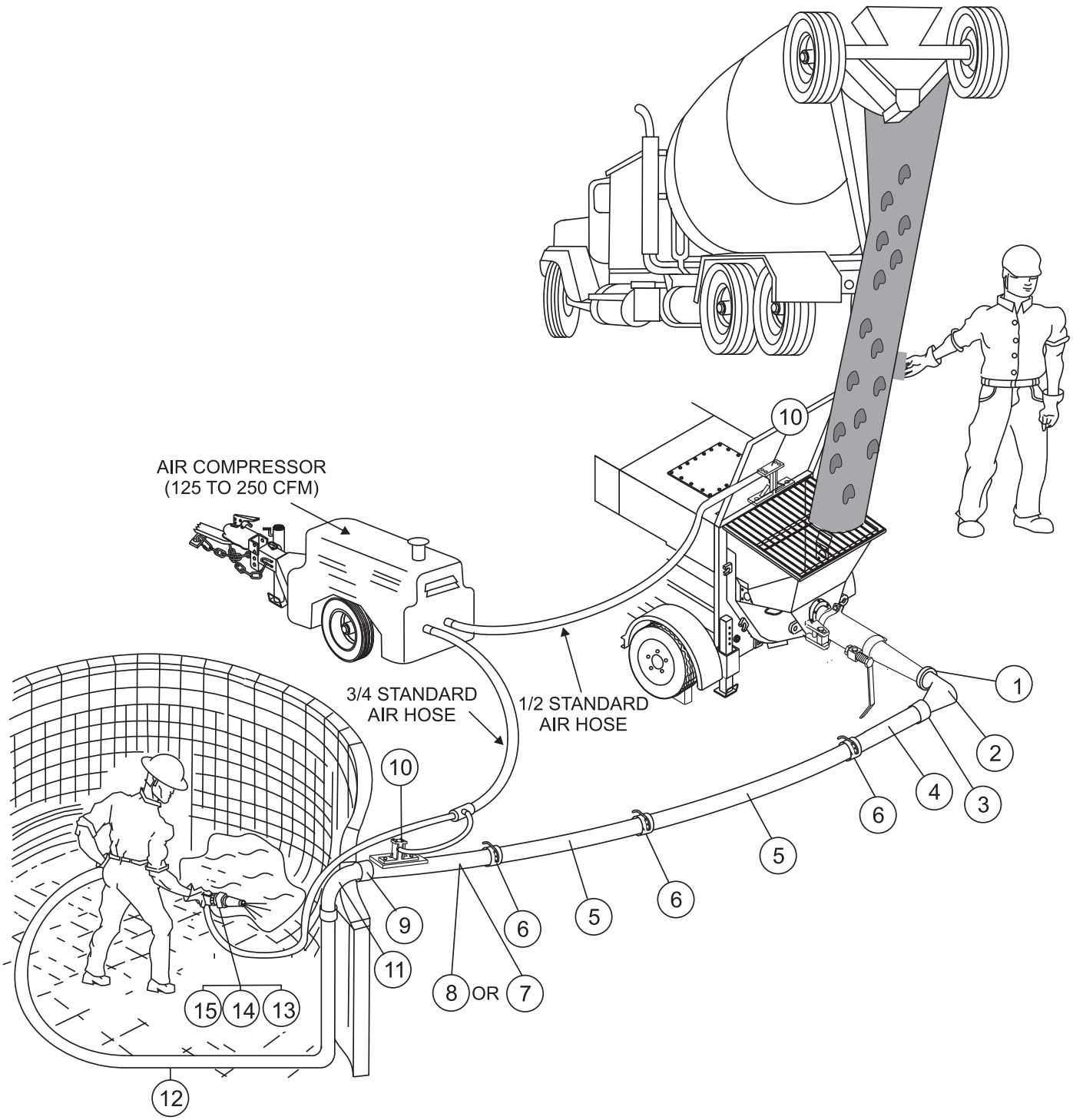


Figure 70. Recommended Shotcrete System

RECOMMENDED SHOTCRETE SYSTEM

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM28906	COUPLING, 5” H-D “CF”		
2	EM25837	ELBOW, 5"x4”x90°		
3	EM28905	COUPLING, 4” H-D w/GASKET & PIN		
4	EM402552	REDUCER, 4”x2.5”x53” H-D ENDS		
5	EM28061	PIPE, 2.5”x120w x 10’ H-D		
6	EM289035	COUPLING, 2.5” H-D w/GASKET & PIN		
7	EM28001DD	REDUCER, 2.5”x2”x36” H-D		
8	EM23815D	REDUCER, 2.5”x2” w/AIR VIBRATOR		
9	EM28902	COUPLING, 2” H-D w/GASKET & PIN		
10	EM23101	AIR VIBRATOR ASSY.		
11	EM28131D	2"x2" ELBOW 90º		
12	EM24841	HOSE, 2”x25’ H-D w/ENDS		
13	EM23808D	NOZZLE ASSEMBLY, 2” H-D		
14	EM23806	NOZZLE TIP, RUBBER 1-3/8”		
15	EM23807	NOZZLE TIP, RUBBER 1.25”		

GENERAL RECOMMENDATIONS

- If the site will permit, use steel pipe from the pump to the pool perimeter. It will reduce line pressures which is highly recommended.
- The vibrator on the reducer by the pool improves pumpability.
- Turn both air vibrators off whenever the pump is stopped to prevent separation of mix.
- The air vibrators are low consumption (4.2 scfm).
- Leave the air on at the nozzle when the pump is stopped to prevent clogging of air the hoses in the air insert.
- Use item #11 (steel elbow) at the edge of the pool to prevent collapse of the rubber hose, which can cause blockage.

RECOMMENDED SHOTCRETE ACCESSORIES

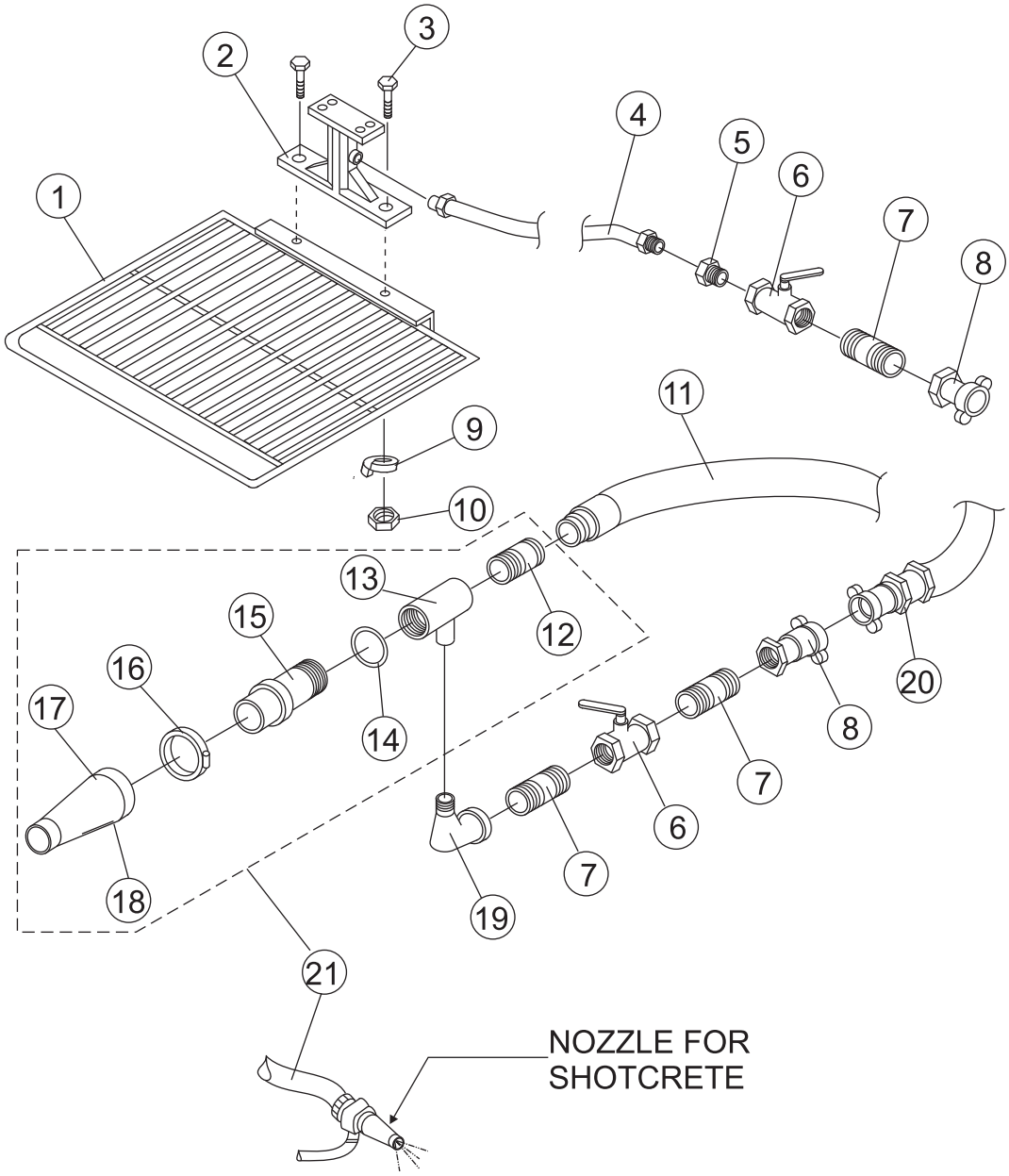


Figure 71. Shotcrete System Accessories

NOTE

Use a 1-3/8" rubber nozzle tip for a wide spray pattern. Use a 1-1/4" rubber nozzle tip for a narrow spray pattern. **DO NOT INSTALL THE NOZZLE AT THE END OF THE HOSE UNTIL THE FIRST MATERIAL HAS PASSED THROUGH THE ENTIRE HOSE LENGTH.**

Disassemble and clean the nozzle assembly thoroughly after each job. Grease all threads before reassembly. **DO NOT** close the air valve when pumping is stopped as a continued air flow keeps the air passages clean.

RECOMMENDED SHOTCRETE ACCESSORIES

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM26107	HOPPER SCREEN	1	W/AIR VIBRATOR MOUNTING
2	EM23101	AIR VIBRATOR	1	
3	EM132	BOLT, 1/2-13X2	2	
4	EM23407	AIR HOSE	1	
5	EM23408	BUSHING	1	
6	EM23411	VALVE	1	
7	EM912073	NIPPLE	2	
8	EM23409	COUPLING	1	
9	EM923346	WASHER, 1/2 LOCK	2	
10	EM406	NUT, HEX 1/2-13	2	
11	EM24841	2"X25' RAISED HOSE		
11	EM24844	2"X50' HOSE HEAVY DUTY		
12*	EM23802	VIC ADAPTER / EM23802D H.D	1	
13*	EM23803	GUN BODY	1	
14*	EM20816	“O” RING	1	
15*	EM23804	AIR INSERT	1	
16*	EM23805	NOZZLE CLAMP	1	
17*	EM23806	NOZZLE TIP, 1-3/8", SHORT	1	
18*	EM23807	NOZZLE TIP, 1-1/4", LONG	1	
19*	EM911076	STREET ELBOW	1	
20		AIR HOSE		NOT SUPPLIED BY MAYCO
21	EM23808	NOZZLE ASSEMBLY	1	INCLUDES ITEMS W/*

LS600 PUMP — EXPLANATION OF CODE IN REMARKS COLUMN

The following section explains the different symbols and remarks used in the Parts section of this manual. Use the help numbers found on the back page of the manual if there are any questions.

NOTICE

The contents and part numbers listed in the parts section are subject to change **without notice**. Multiquip does not guarantee the availability of the parts listed.

SAMPLE PARTS LIST

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	12345	BOLT	1	INCLUDES ITEMS W/%
2%		WASHER, 1/4 IN		NOT SOLD SEPARATELY
2%	12347	WASHER, 3/8 IN	1	MQ-45T ONLY
3	12348	HOSE	A/R	MAKE LOCALLY
4	12349	BEARING	1	S/N 2345B AND ABOVE

NO. Column

Unique Symbols — All items with same unique symbol

(@, #, +, %, or >) in the number column belong to the same assembly or kit, which is indicated by a note in the "Remarks" column.

Duplicate Item Numbers — Duplicate numbers indicate multiple part numbers, which are in effect for the same general item, such as different size saw blade guards in use or a part that has been updated on newer versions of the same machine.

NOTICE

When ordering a part that has more than one item number listed, check the remarks column for help in determining the proper part to order.

PART NO. Column

Numbers Used — Part numbers can be indicated by a number, a blank entry, or TBD.

TBD (To Be Determined) is generally used to show a part that has not been assigned a formal part number at the time of publication.

A blank entry generally indicates that the item is not sold separately or is not sold by Multiquip. Other entries will be clarified in the "Remarks" Column.

QTY. Column

Numbers Used — Item quantity can be indicated by a number, a blank entry, or A/R.

A/R (As Required) is generally used for hoses or other parts that are sold in bulk and cut to length.

A blank entry generally indicates that the item is not sold separately. Other entries will be clarified in the "Remarks" Column.

REMARKS Column

Some of the most common notes found in the "Remarks" Column are listed below. Other additional notes needed to describe the item can also be shown.

Assembly/Kit — All items on the parts list with the same unique symbol will be included when this item is purchased.

Indicated by:

"INCLUDES ITEMS W/(unique symbol)"

Serial Number Break — Used to list an effective serial number range where a particular part is used.

Indicated by:

"S/N XXXXX AND BELOW"
"S/N XXXX AND ABOVE"
"S/N XXXX TO S/N XXX"

Specific Model Number Use — Indicates that the part is used only with the specific model number or model number variant listed. It can also be used to show a part is NOT used on a specific model or model number variant.

Indicated by:

"XXXXX ONLY"
"NOT USED ON XXXX"

"Make/Obtain Locally" — Indicates that the part can be purchased at any hardware shop or made out of available items. Examples include battery cables, shims, and certain washers and nuts.

"Not Sold Separately" — Indicates that an item cannot be purchased as a separate item and is either part of an assembly/kit that can be purchased, or is not available for sale through Multiquip.

LS600 CONCRETE PUMP *1 Unit*

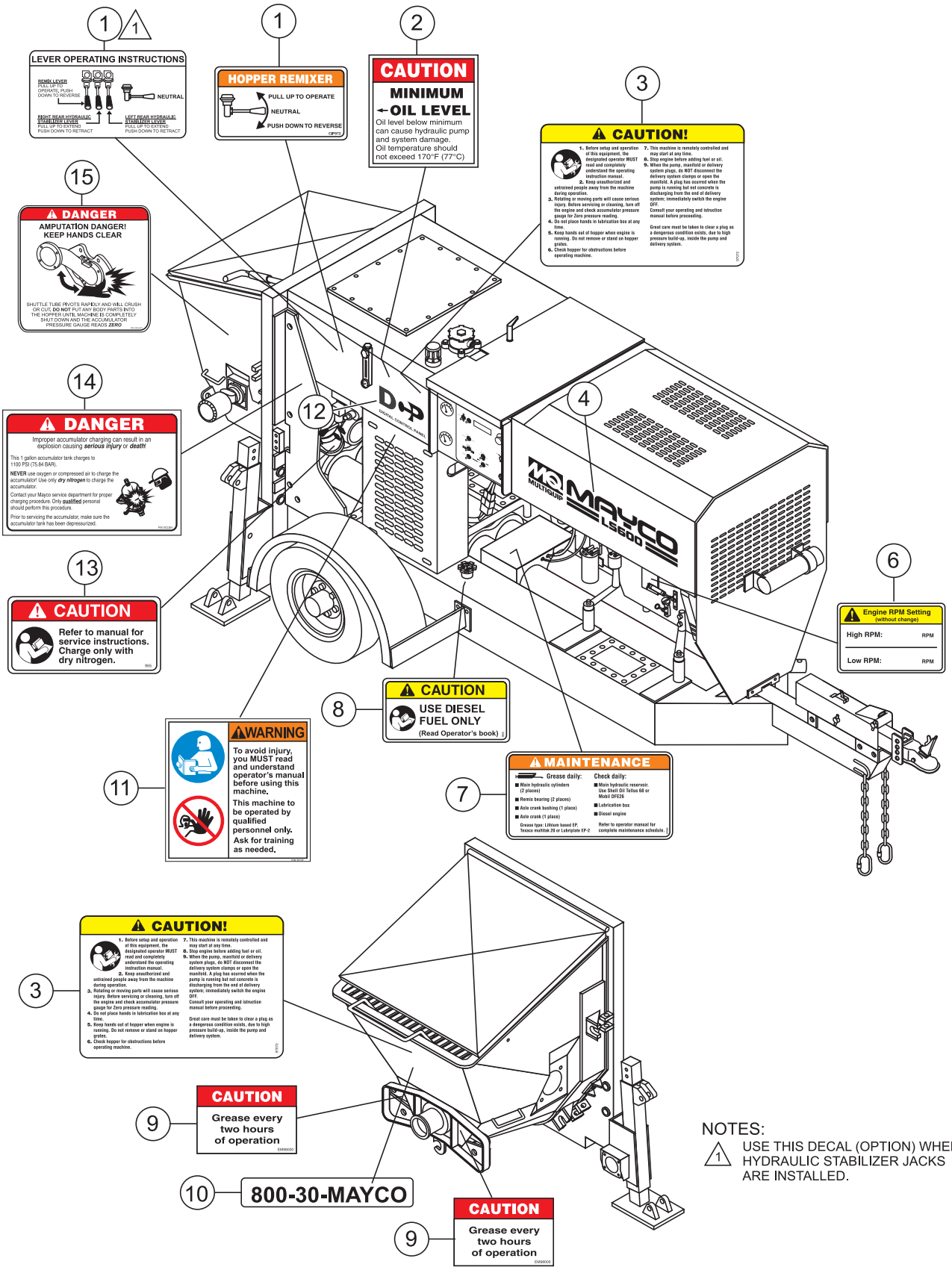
Qty.	P/N	Description
1	EM16462	FELT HOLDER
4	EM98050	PISTON CUP, ORANGE
4	EM16493	FELT RING
1	EM98033	OIL PLATE
2	EM14408	BRONZE RING
2	EM16145	BUSHING, SWING AXLE (BRONZE)
1	EM98021	WEAR PLATE
2	EM16816-1A	ENERGIZER RING
1	EM16816-2	INSERT RING
2	EM98065	SLEEVE SEAL
1	EM98022	WEAR RING
1	EM98065	RUBBER RING
2	EM14407	O-RING
1	34507	CAP, FUEL
2	EM20763	FILTER, FUEL (IN LINE)
1	P53712	CARTRIDGE, WATER SEPARATOR
3	01174416	FILTER, OIL (ENGINE)
3	01174696	FILTER, FUEL (ENGINE)
1	EM98163	PROXIMITY SWITCH
3	EM98093P	ELEMENT, PRIMARY, AIR FILTER
3	EM98093S	ELEMENT, SECONDARY, AIR FILTER
1	EM981121	ELEMENT, RETURN OIL
		S/N 281100 AND BELOW
1	EM98275	ELEMENT, RETURN OIL
		S/N 281101 AND ABOVE

LS600 CONCRETE PUMP *3 Units*

Qty.	P/N	Description
1	EM16459	PIN
2	EM25801	CONCRETE CYLINDER
4	EM16462	FELT HOLDER
6	EM98050	PISTON CUP, ORANGE
8	EM16493	FELT RING
4	EM98033	OIL PLATE
4	EM14408	BRONZE RING
4	EM16145A	BUSHING, SWING AXLE (BRONZE)
3	EM98021A	WEAR PLATE
4	EM16816-1A	ENERGIZER RING
2	EM16816-2	INSERT RING
4	EM98065	SLEEVE SEAL
6	EM98022	WEAR RING
3	EM98065	RUBBER RING
6	EM14407	O-RING
2	EM16174	O-RING
2	EM98163	SWITCH, PROXIMITY
6	510265	BOLT, HEX HEAD 3/8 NC x 3-1/4 IN. G8
1	34507	CAP, FUEL
6	EM20763	FILTER, FUEL
3	P53712	CARTRIDGE, WATER SEPARATOR
9	01174416	FILTER, OIL (ENGINE)
9	01174696	FILTER, FUEL (ENGINE)
9	EM98093P	ELEMENT, PRIMARY, AIR FILTER
9	EM98093S	ELEMENT, SECONDARY, AIR FILTER
9	EM981121	ELEMENT, RETURN OIL
		S/N 281100 AND BELOW
9	EM98275	ELEMENT, RETURN OIL
		S/N 281101 AND ABOVE



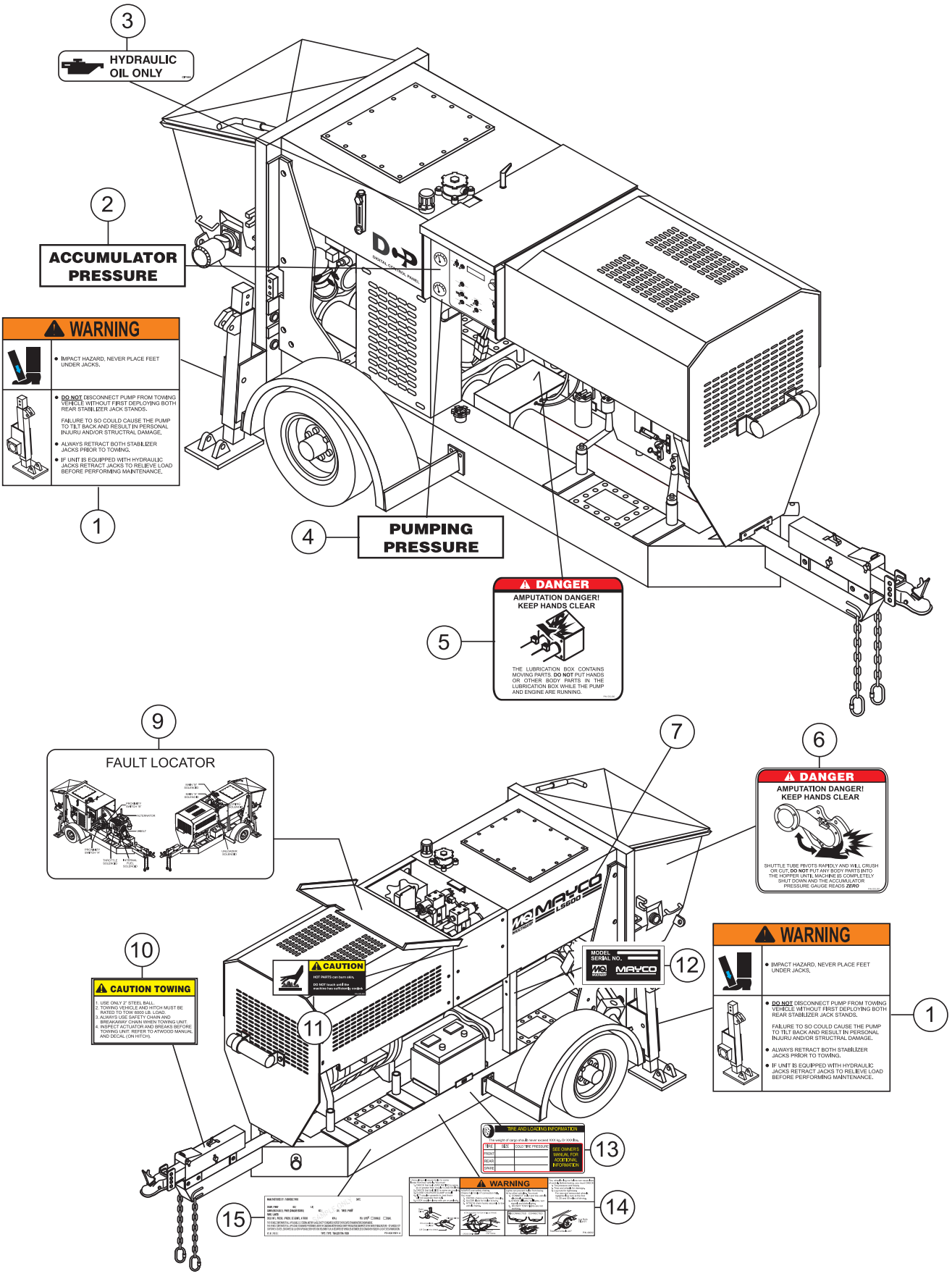
Part numbers on this Suggested Spare Parts List may supersede or replace the P/N shown in the text pages of this book.



NOTES:

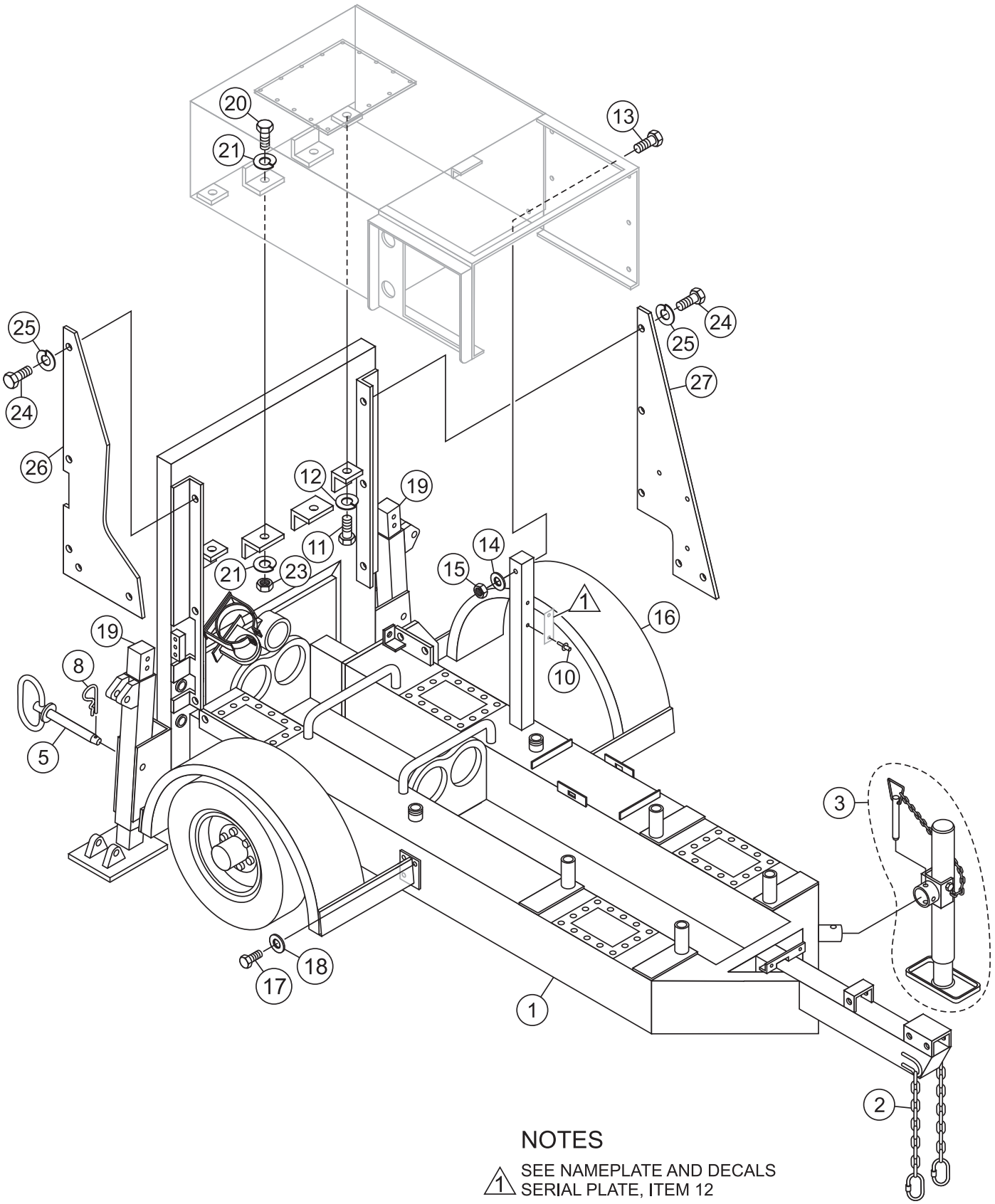
1. USE THIS DECAL (OPTION) WHEN HYDRAULIC STABILIZER JACKS ARE INSTALLED.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM970	DECAL, HOPPER REX MIXER	1	
1	TBD	DECAL, LEVER OPERATING INSTRUCTIONS	1	 OPTION (HYD. JACKS)
2	EM511091	DECAL, MINIMUM OIL LEVEL	1	
3	EM97072	DECAL, CAUTION - OP. INSTRUCTIONS	2	
4	EM517644	DECAL, MQ/MAYCO LS600 LOGO	1	
6	513580	DECAL, ENGINE RPM SETTING	1	
7	EM97084	DECAL, MAINTENANCE	1	
8	EM995	DECAL, CAUTION DIESEL FUEL	1	
9	EM98000	DECAL, CAUTION - GREASE 2 HOURS	2	
10	511709	DECAL, 800-30-MAYCO	1	
11	35137	DECAL, CAUTION READ MANUAL	1	
12	517907	DIGITAL CONTROL PANEL LOGO	1	
13	EM955	DECAL, DANGER CHARGING ACCUM.	1	
14	DCL304	DECAL, DANGER IMPROPER CHARGING	1	
15	DCL301	DECAL, SHUTTLE TUBE DANGER	1	


3
HYDRAULIC OIL ONLY
2
ACCUMULATOR PRESSURE
WARNING
IMPACT HAZARD, NEVER PLACE FEET UNDER JACKS.
DO NOT DISCONNECT PUMP FROM TOWING VEHICLE WITHOUT FIRST DEPLOYING BOTH REAR STABILIZER JACK STANDS.
FAILURE TO SO COULD CAUSE THE PUMP TO TILT BACK AND RESULT IN PERSONAL INJURU AND/OR STRUCTRAL DAMAGE.
ALWAYS RETRACT BOTH STABILIZER JACKS PRIOR TO TOWING.
IF UNIT IS EQUIPPED WITH HYDRAULIC JACKS RETRACT JACKS TO RELIEVE LOAD BEFORE PERFORMING MAINTENANCE.
1
4
PUMPING PRESSURE
DANGER
AMPUTATION DANGER! KEEP HANDS CLEAR
THE LUBRICATION BOX CONTAINS MOVING PARTS. DO NOT PUT HANDS OR OTHER BODY PARTS IN THE LUBRICATION BOX WHILE THE PUMP AND ENGINE ARE RUNNING.
5
9
FAULT LOCATOR
7
6
DANGER
AMPUTATION DANGER! KEEP HANDS CLEAR
SHUTTLE TUBE PIVOTS RARDLY AND WILL CRUSH OR CUT. DO NOT PUT ANY BODY PARTS INTO THE HOPPER UNTIL MACHINE IS COMPLETELY SHUT DOWN AND THE ACCUMULATOR PRESSURE GAUGE READS ZERO
10
CAUTION TOWING
1. USE ONLY 2" STEEL BALL.
2. TOWING VEHICLE AND HITCH MUST BE RATED TO TOW 6000 LB. LOAD.
3. ALWAYS USE SAFETY CHAIN AND BREAKAWAY CHAIN WHEN TOWING UNIT.
4. INSPECT ACTUATOR AND BREAKS BEFORE TOWING UNIT. REFER TO ATWOOD MANUAL AND DECAL ON HITCH.
CAUTION
11
MODEL
SERIAL NO.
MAYCO
12
WARNING
IMPACT HAZARD, NEVER PLACE FEET UNDER JACKS.
DO NOT DISCONNECT PUMP FROM TOWING VEHICLE WITHOUT FIRST DEPLOYING BOTH REAR STABILIZER JACK STANDS.
FAILURE TO SO COULD CAUSE THE PUMP TO TILT BACK AND RESULT IN PERSONAL INJURU AND/OR STRUCTRAL DAMAGE.
ALWAYS RETRACT BOTH STABILIZER JACKS PRIOR TO TOWING.
IF UNIT IS EQUIPPED WITH HYDRAULIC JACKS RETRACT JACKS TO RELIEVE LOAD BEFORE PERFORMING MAINTENANCE.
1
8
TIRE AND LOADING INFORMATION
13
WARNING
14
15

LS600 PUMP — NAMEPLATE AND DECALS

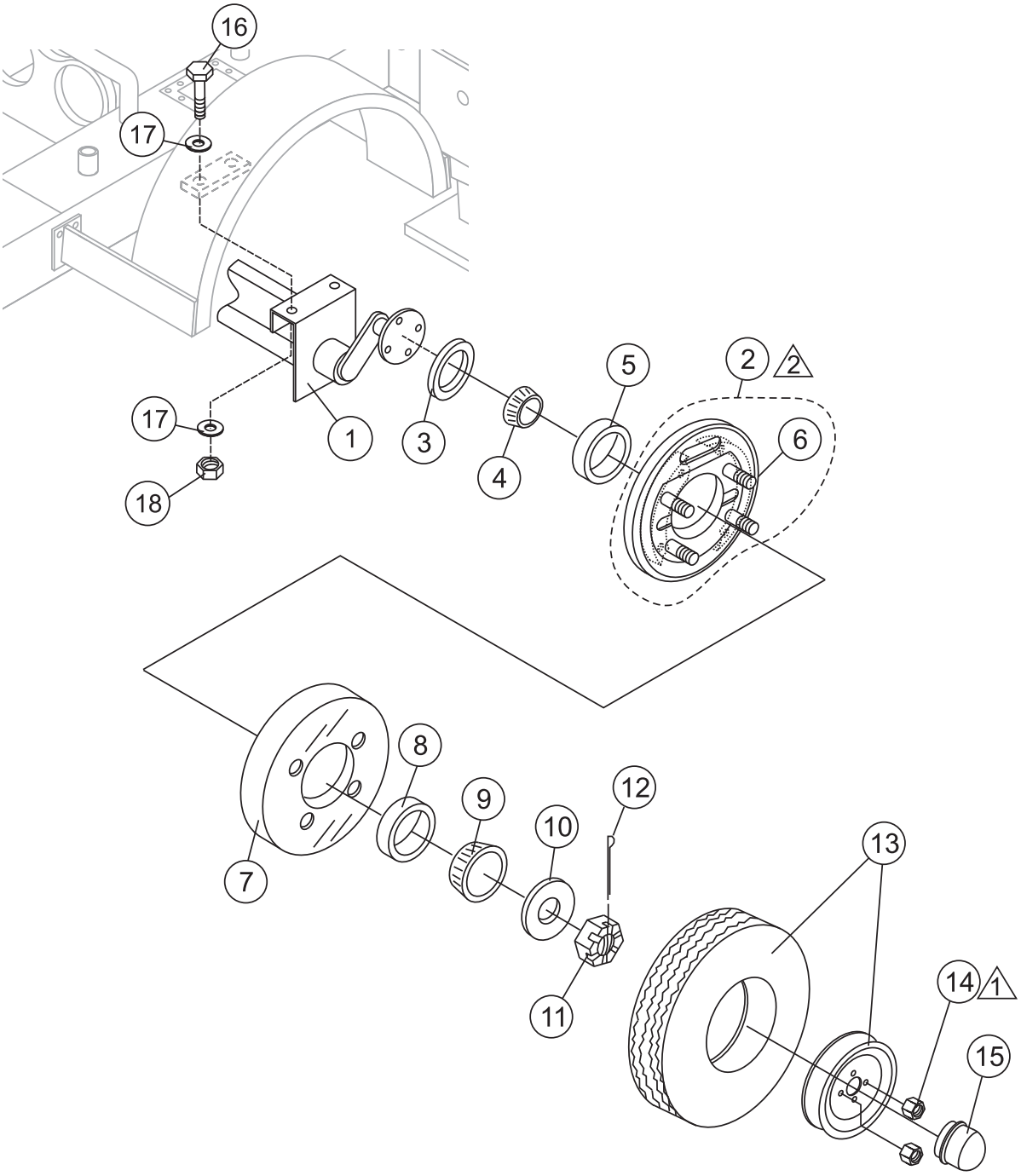
NO.	PART NO.	PART NAME	QTY.	REMARKS
1	TBD	DECAL, IMPACT HAZARD	1	
2	EM97070	DECAL, ACCUMULATOR PRESSURE	1	INCLUDED W/ITEM 4
3	EM985	DECAL, HYDRAULIC OIL ONLY	1	
4	EM97070	DECAL, PUMPING PRESSURE DECAL	1	INCLUDED W/ITEM 2
5	DCL300	DECAL, DANGER LUBRICATION BOX	1	
6	DCL301	DECAL, SHUTTLE TUBE DANGER	1	
7	EM517644	DECAL, MQ/MAYCO LS600 LOGO	1	
9	TBD	DECAL, FAULT LOCATOR	1	
10	EM696	DECAL, CAUTION - TOWING DECAL	1	
11	DCL302	DECAL, WARNING BURN HAZARD	1	
12		SERIAL PLATE	1	CONTACT MQ PARTS DEPT.
13	TBD	DECAL, TIRE LOADING	1	
14	49002	DECAL, WARNING COUPLER	1	
15	TBD	DECAL, VIN IDENTIFICATION	1	



NOTES

1 SEE NAMEPLATE AND DECALS SERIAL PLATE, ITEM 12

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	514355	FRAME, MAIN	1	
2	EM516581	CHAIN, TRAILER HITCH, 3/8 X 40", GRADE 40	2	
3	EM25610	JACK STAND, FRONT	1	
5	EM744	CLEVIS PIN	2	
8	EM491686	PIN	2	
10	EM491744	RIVET, POP AM-44	2	
11	509562	BOLT, 3/8" NC X 5/8" G5	2	
12	0166 A	LOCK, WASHER 3/8"	2	REPLACES 492624
13	503112	BOLT 3/8" X 2-3/4"	1	
14	3019092	WASHER 3/8"	2	REPLACES 492598
15	EM969013	NUT 3/8"	1	REPLACES 492583
16	517985	FENDOR, BOLT ON	2	
17	504456	BOLT 1/2" NC X 3/4" G5	12	
18	6109180	WASHER, LOCK 1/2 IN.	12	REPLACES 492626
19	517113	STABILIZER STAND	2	
20	492376	BOLT 3/8" NC X 1-1/4" G5	2	
21	0166 A	WASHER, LOCK 3/8"	4	REPLACES 492624
23	EM969013	NUT 3/8"	2	REPLACES 492583
24	517124	BOLT 3/4" NC X 1" G5	10	
25	EM923350	WASHER, LOCK 3/4 IN.	10	REPLACES EM492628
26	517092	SUPPORT PLATE, RIGHT	1	
27	517095	SUPPORT PLATE, LEFT	1	



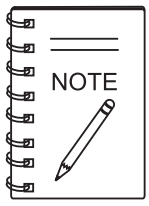
NOTES:

1. TORQUE LUG NUTS PER LUG NUT TORQUE TABLE REFERENCED IN THIS MANUAL.

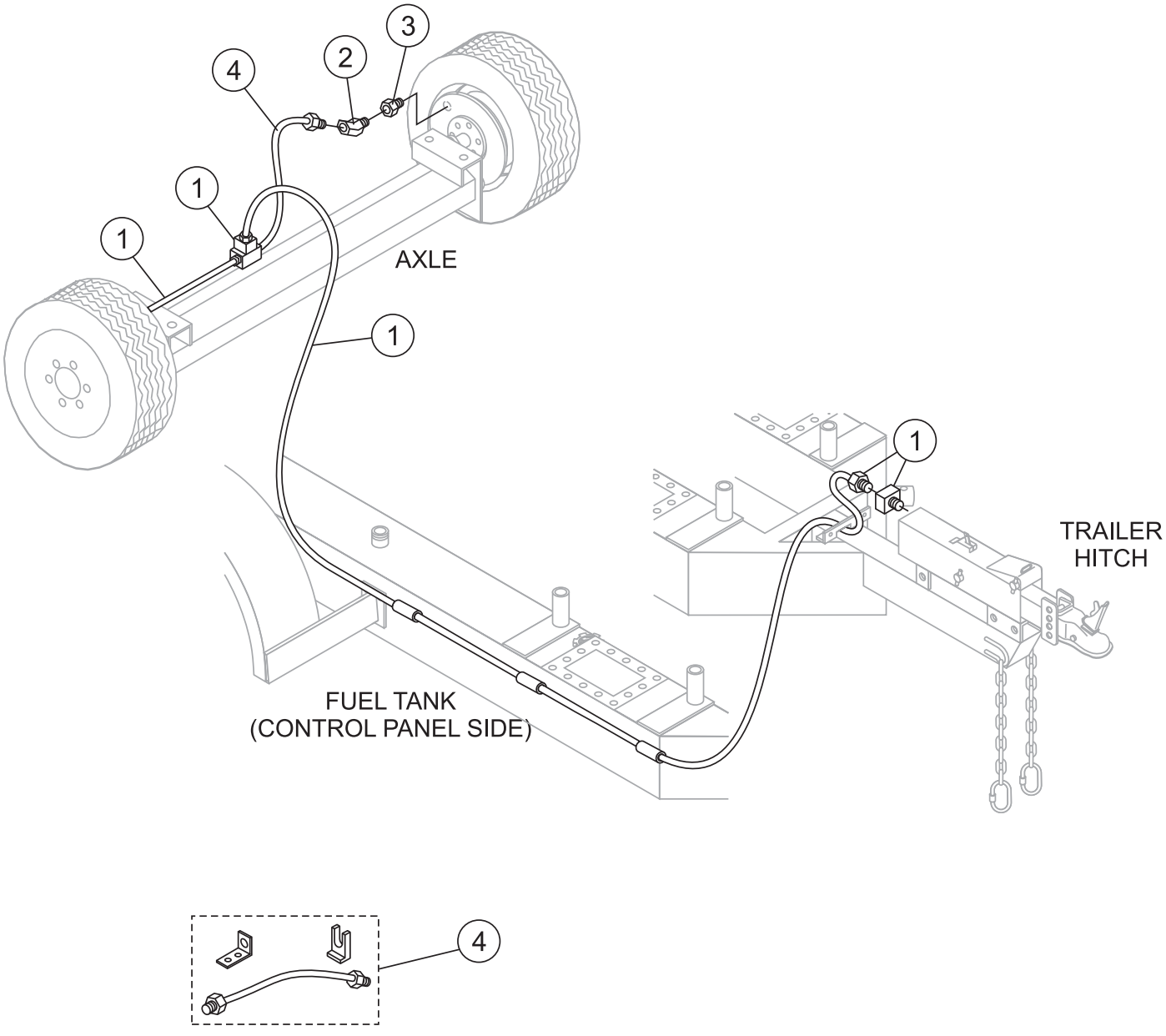
2. RIGHT AND LEFT SIDE AXLE ASSEMBLIES ARE IDENTICAL WITH THE EXCEPTION OF THE BRAKE ASSEMBLY.

LS600 PUMP — AXLE ASSY. (RIGHT/LEFT)

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM98116	AXLE, TORSION BAR ASSY.	1	
2	EM092305	BRAKE ASSY COMPLETE, RIGHT	1	INCLUDES ITEMS W/#
2	EM092306	BRAKE ASSY COMPLETE, LEFT	1	INCLUDES ITEMS W/%
				SEE NOTE BELOW
3	363198	OIL SEAL	1	
4	363196	INNER BEARING CONE 2 IN.	1	
5	383911	INNER BEARING CUP 2 IN.	1	
6#%	363909	WHEEL STUD 1/2 IN. - 20 UNF PRESS IN	8	
7	363239	HUB AND DRUM ASSY.	2	
8	363916	OUTER BEARING CONE	1	
9	363420	OUTER BEARING CUP	1	
10	568326	LOAD WASHER 1 IN. T5 HP	1	
11	363257	SLOTTED NUT, 1 IN. UNF	2	
12	363258	COTTER PIN 3/16 IN. X 1-1/2	2	
13	EM514813	RIM AND TIRE	2	
14	363203	WHEEL LUG NUTS 1/2 UNF 60 CON	8	
15	363199	GREASE CAP	2	
16	EM104	BOLT, HEX HEAD 5/8 IN. NC X 2 IN. G5	4	REPLACES 503982
17	0401450160	WASHER, FLAT 5/8 IN.	8	REPLACES 492602
18	EM969023	NUT, LOCK 5/8 IN.	4	REPLACES 492586



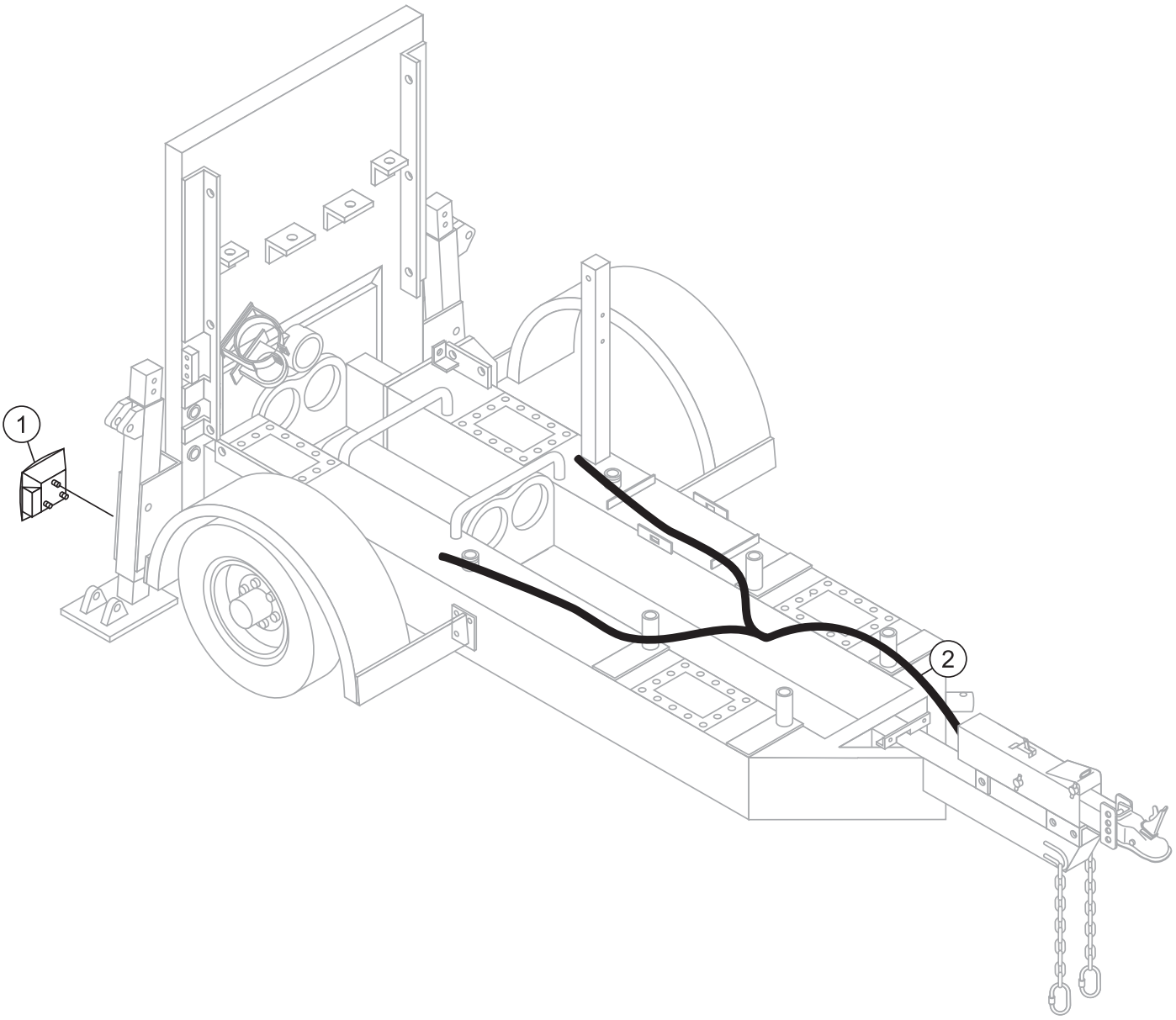
RIGHT AND LEFT SIDE AXLE ASSEMBLIES ARE IDENTICAL WITH THE EXCEPTION OF THE BRAKE ASSEMBLY.


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AXLE
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TRAILER
HITCH
FUEL TANK
(CONTROL PANEL SIDE)

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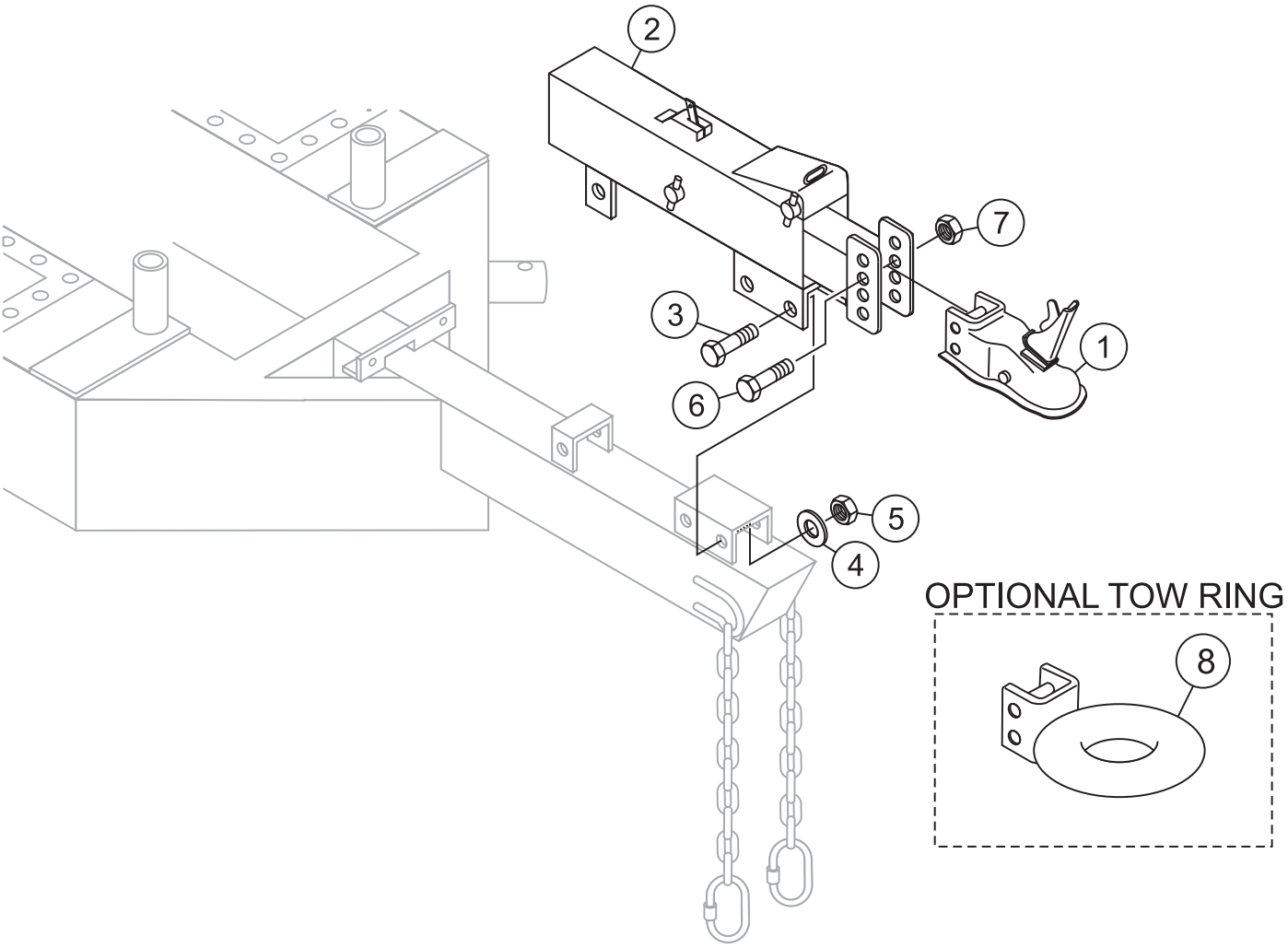
LS600 PUMP — BRAKE LINE ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	34566	KIT, MAIN BRAKE LINE	1	
2	EM512877	ADAPTOR, STRAIGHT	2	
3	EM512876	ADAPTOR, ELBOW	2	
4	34565	KIT, WHEEL BRAKE LINE	1	


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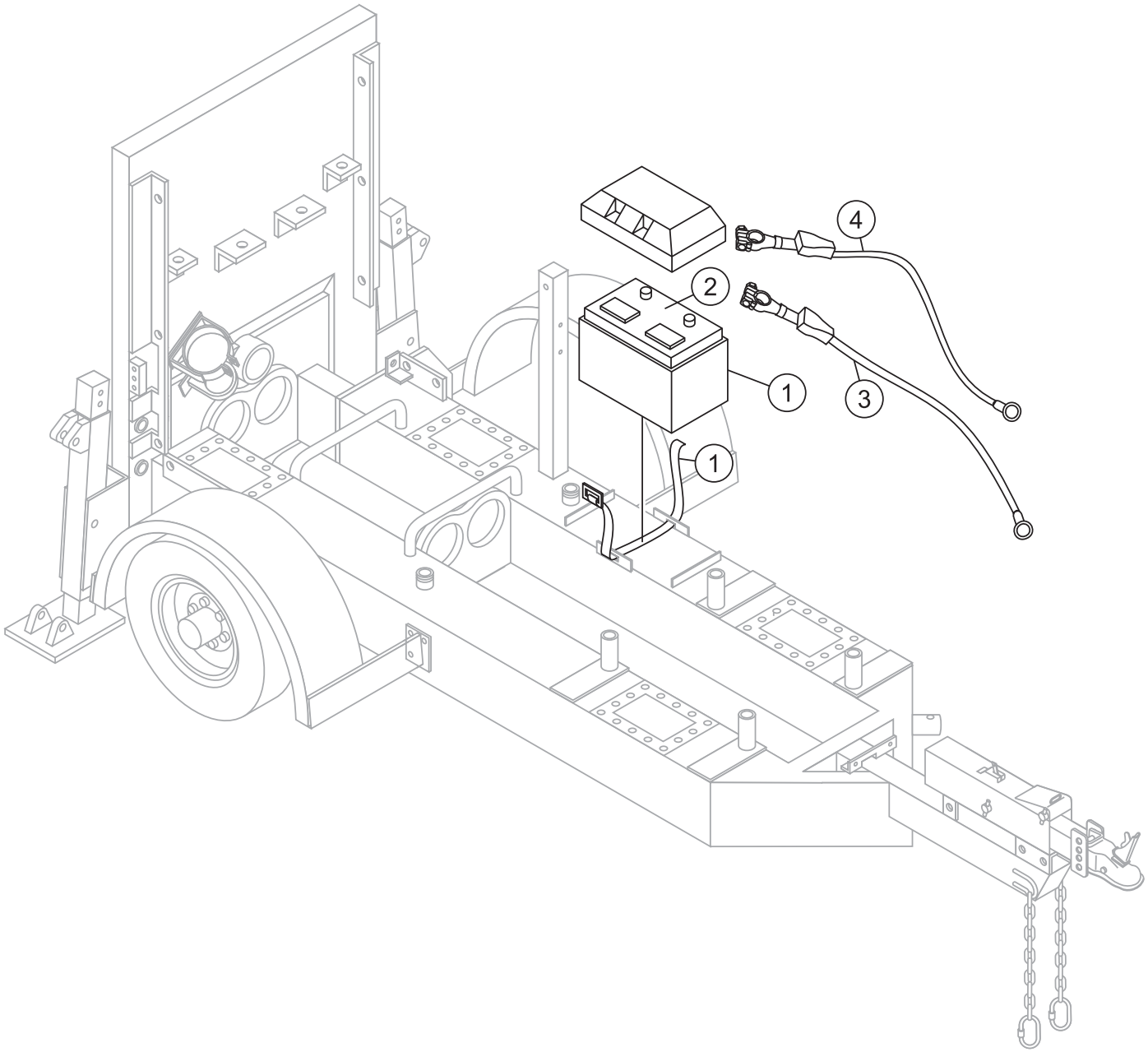
LS600 PUMP — BRAKE LIGHT ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	29242	BRAKE LIGHT ASSY.	2	
2	29207	HARNESS ASSY. W/RECEPTACLES	1	


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OPTIONAL TOW RING
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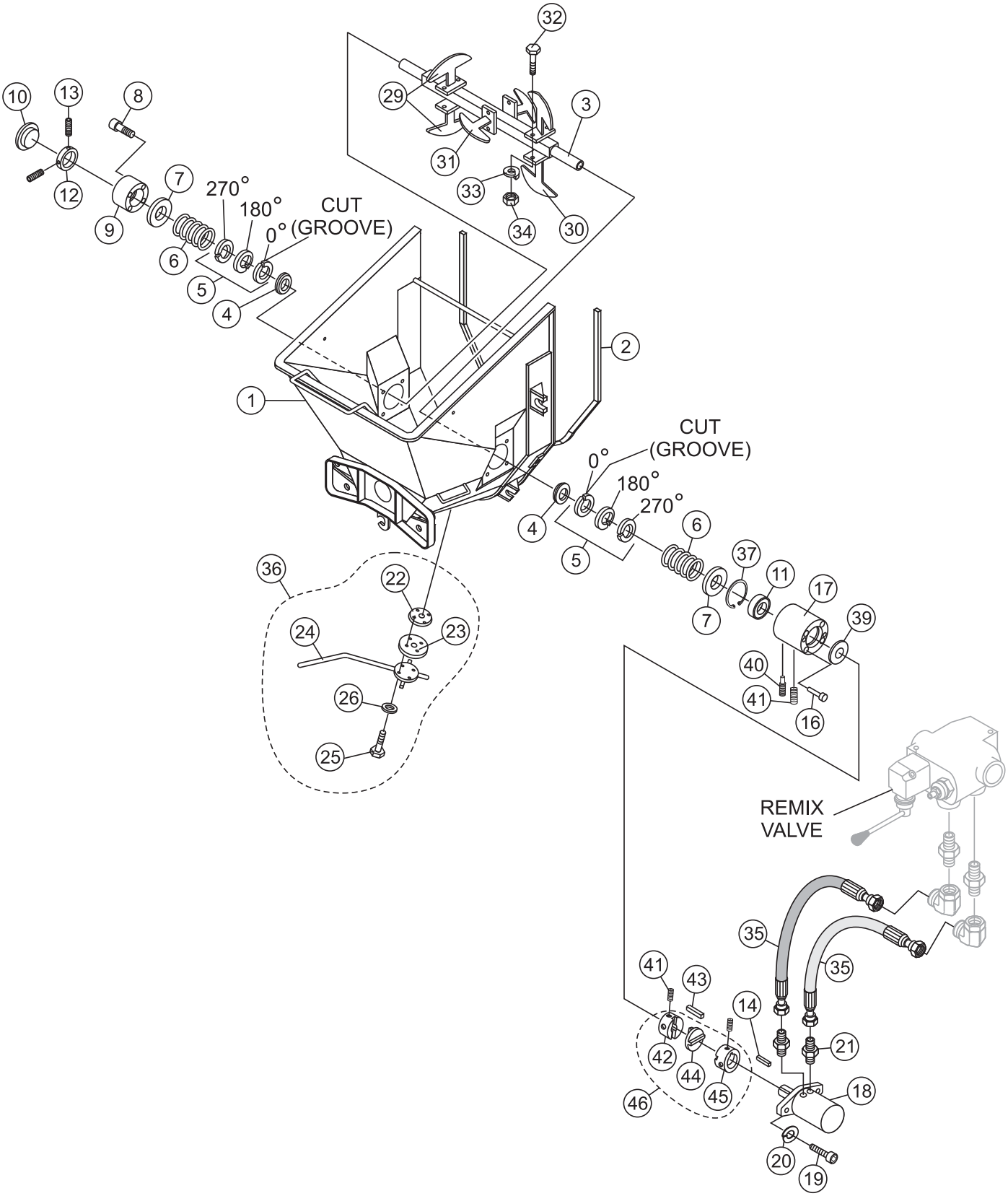
LS600 PUMP — TRAILER HITCH ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM29228	COUPLING, TRAILER 2 IN.BALL, 6000 LBS	1	
2	EM19067	ACTUATOR, BRAKE	1	
3	EM503111	BOLT, HEX HEAD 1/2 NC X 4-1/2 IN.	3	
4	EM492600	WASHER, FLAT 1/2 IN.	3	
5	EM492584	NUT, LOCK 1/2 IN.	3	
6	EM507658	BOLT, HEX HEAD 5/8 NC X 4-1/2 IN. G5	2	
7	EM492586	NUT, LOCK 5/8 IN.	2	
8	16137	TOW RING, 3 IN. LUNETTE EYE	1	


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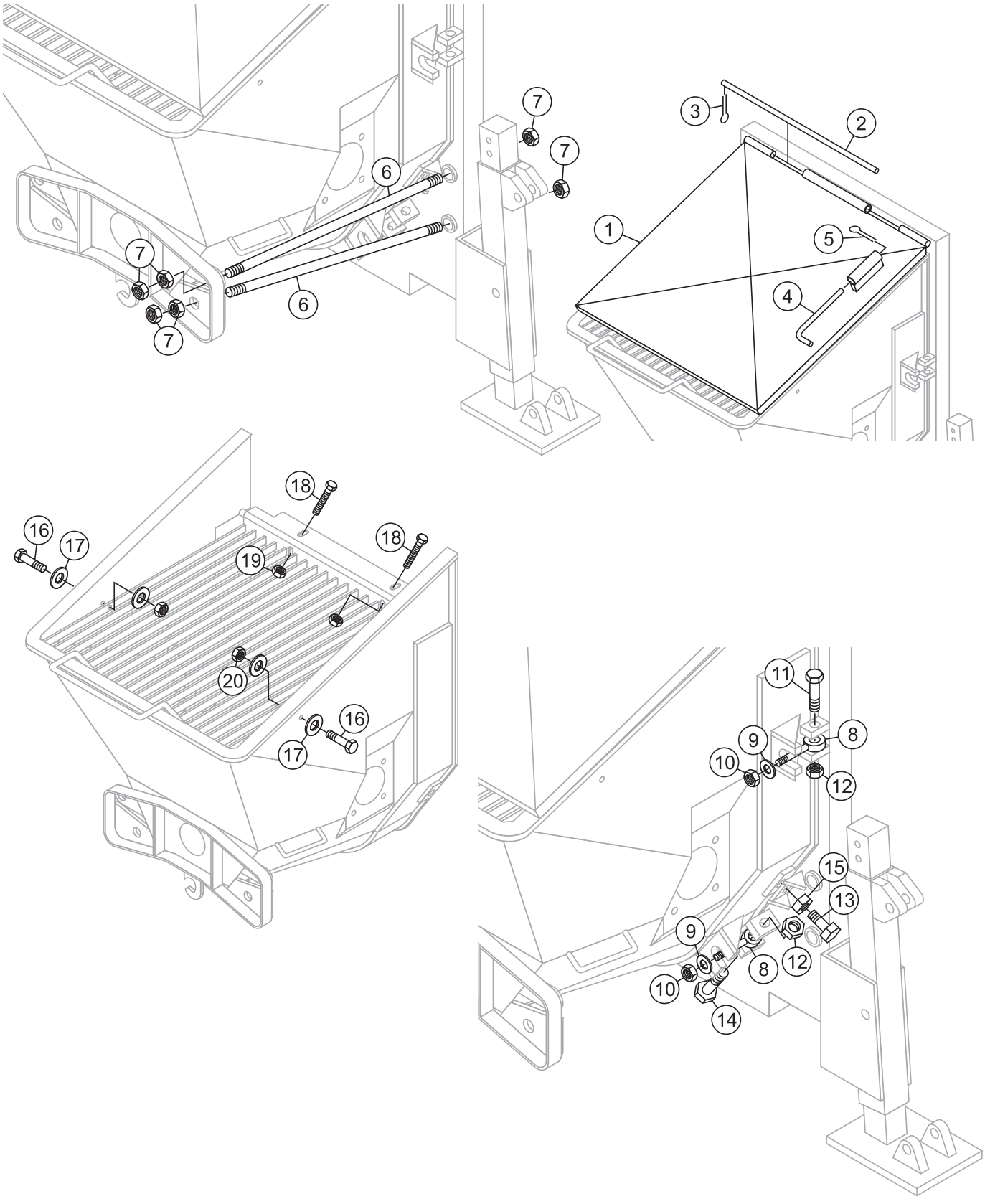
LS600 PUMP — BATTERY ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM34506	BATTERY BOX W/ BELT	1	
2	EM16738	BATTERY 12V 125A	1	
3	514856	BATTERY CABLE POSITIVE	1	
4	513577	BATTERY CABLE NEGATIVE	1	


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REMIX
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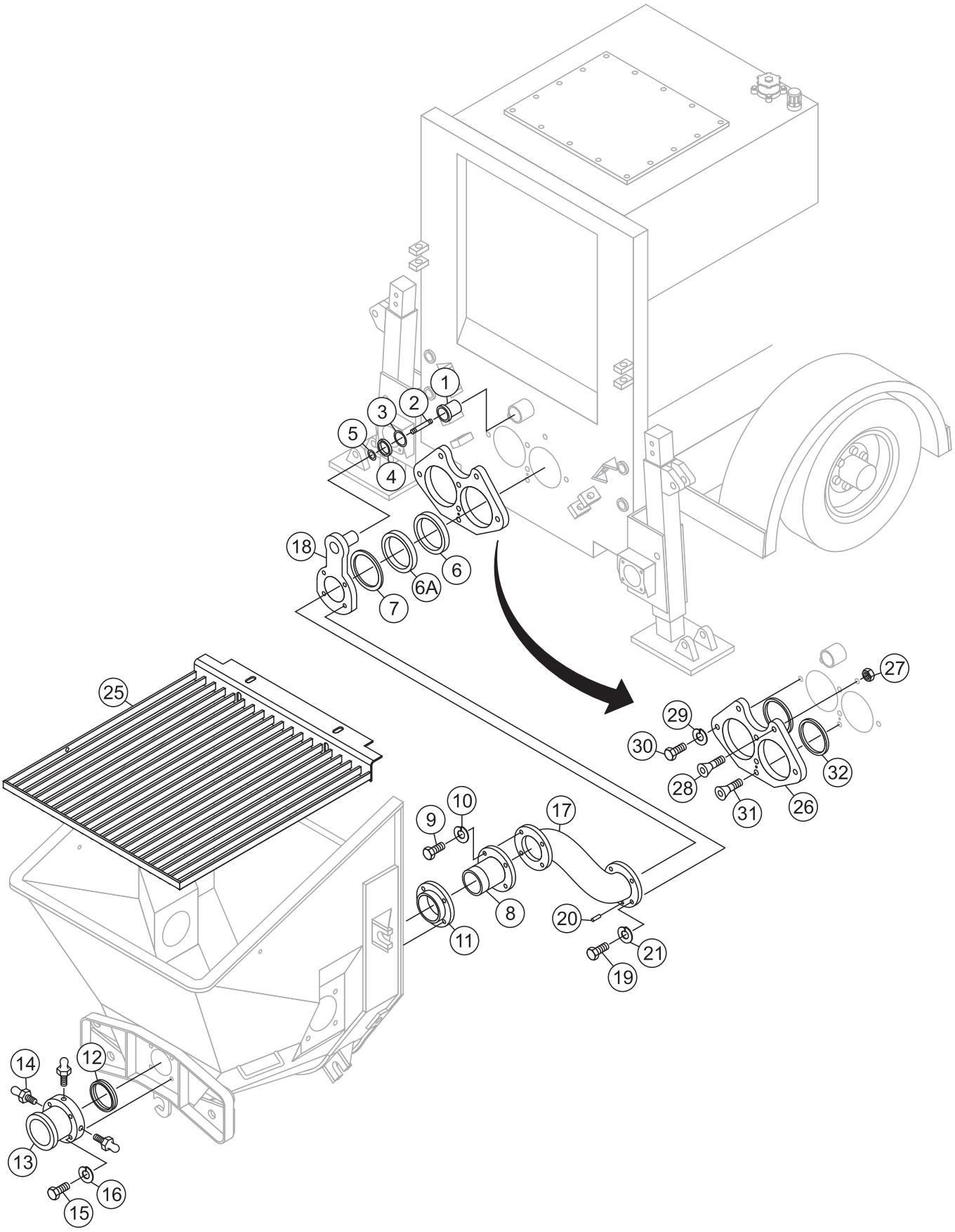
LS600 PUMP — HOPPER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM515980	HOPPER ASSY	1	
2	EM16184	HOPPER SEAL	1	
3	EM516779	REMIXER SHAFT	1	
4	EM200303	FOLLOWER RING	2	
5	EM200301	GRAPHITE SEAL	6	
6	EM516820	COMPRESSION SPRING	2	
7	EM514339	HOPPER SPRING SEAT	2	
8	510717	BOLT 1/2 X 1-3/4 IN.	4	
9	EM514338	SUPPORT, LEFT	1	
10	EM514706	END CAP, SHAFT SUPPORT	1	
11	EM902153	BEARING	2	
12	EM200018	SET COLLAR	1	
13	EM703	SET SCREW	2	REPLACES 492470
14	500264	KEY 3/8 IN.	1	
16	EM511428	BOLT 1/2 X 3-1/2 IN.	4	
17	EM516780	HOUSING	1	
18	EM98108	MOTOR, REMIX	1	
19	505989	BOLT 1/2 X 1-1/4 IN.	2	
20	6109180	WASHER, LOCK 1/2 IN.	2	REPLACES 492626
21	EM25508	ADAPTER, FITTING	2	
22	EM70860-1	PISTON CUP HOLDER	1	
23	EM50417	PISTON CUP	1	
24	EM508830	HANDLE	1	
25	492378	BOLT 3/8 X 1-3/4 IN.	4	
26	0166 A	WASHER, LOCK 3/8 IN.	4	REPLACES 492624
29	EM514031	PADDLE ARM, END	2	
30	EM514032	PADDLE ARM, MOTOR END	2	
31	EM514033	PADDLE ARM, CENTER	2	
32	513454	BOLT 1/2 X 3-1/4 IN.	6	
33	6109180	WASHER, LOCK 1/2 IN.	6	REPLACES 492626
34	492589	HEX NUT 1/2 IN.	6	REPLACES 507661
35	EM25483	HOSE	2	
36	EM70860	HANDLE ASSY.	1	
37	EM515460	RETAINING RING	1	
39	516799	SPACER 6MM	1	
40	EM702	DOG POINT SET SCREW 3/8"	1	
41	EM703	SET SCREW 3/8"	3	
42%	516787	REMIX SHAFT COUPLER	1	
43	EM500264	SQUARE KEY 3/8"	1	
44%	516776	DRIVE MEMBER COUPLER	1	
45%	516775	MOTOR SHAFT COUPLER	1	
46	EM516786	COUPLER ASSY	1	INCLUDES ITEMS W/%


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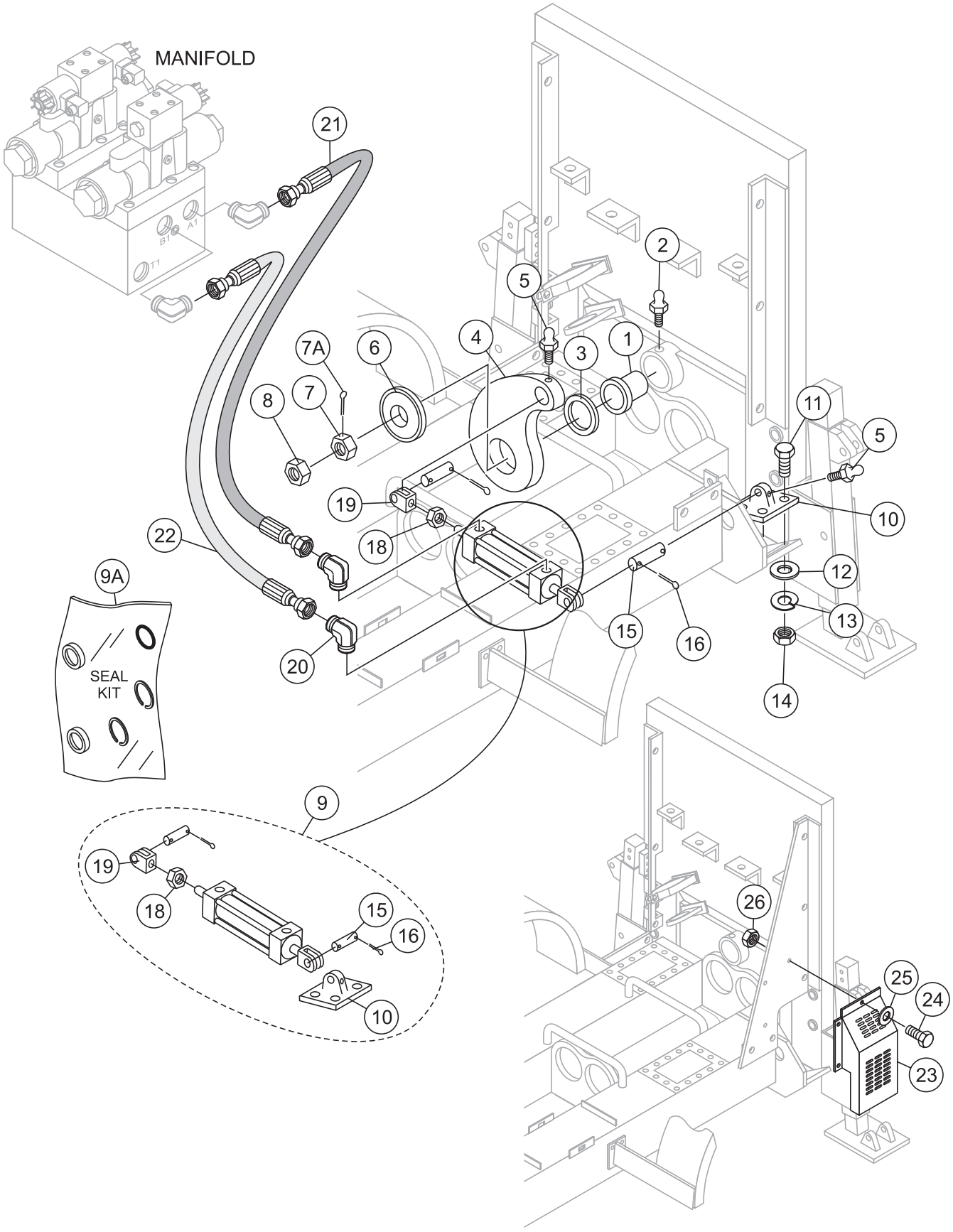
LS600 PUMP — HOPPER ATTACHMENT ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM514204	SPLASH PLATE	1	
2	EM514620	HINGE PIN	1	
3	EM491686	COTTER PIN 1/8 X 1-1/2 IN.	1	
4	EM70134-2	PIN, SPLASH PLATE	1	
5	EM505723	COTTER PIN 5/32 X 1-1/2 IN.	1	
6	EM16166	TIE ROD	4	
7	505728	NUT, HEX 1 IN. NC	12	
8	EM14165	EYE BOLT 3/4 IN.	4	
9	EM619	O-RING 3/4 IN.	4	
10	EM968446	NUT, HEX 3/4 IN.	4	
11	505121	BOLT 3/4 IN. X 3 IN.	4	
12	EM968446	HEX NUT 3/4 IN.	4	
13	505123	HEX BOLT 1/2 X 2-1/2 IN.	2	
14	492491	HEX BOLT 1/2 X 1-1/2 IN.	1	
15	6109160	HEX NUT 1/2 IN.	3	REPLACES 492556
16	492379	SCREW CAP 3/8"	2	
17	3019092	WASHER FLAT 3/8"	4	
18	515395	BOLT 7/16 NC X 4" G5	2	
19	492584	NUT LOCK 1/2"	2	
20	EM969013	NUT NYLOC	2	


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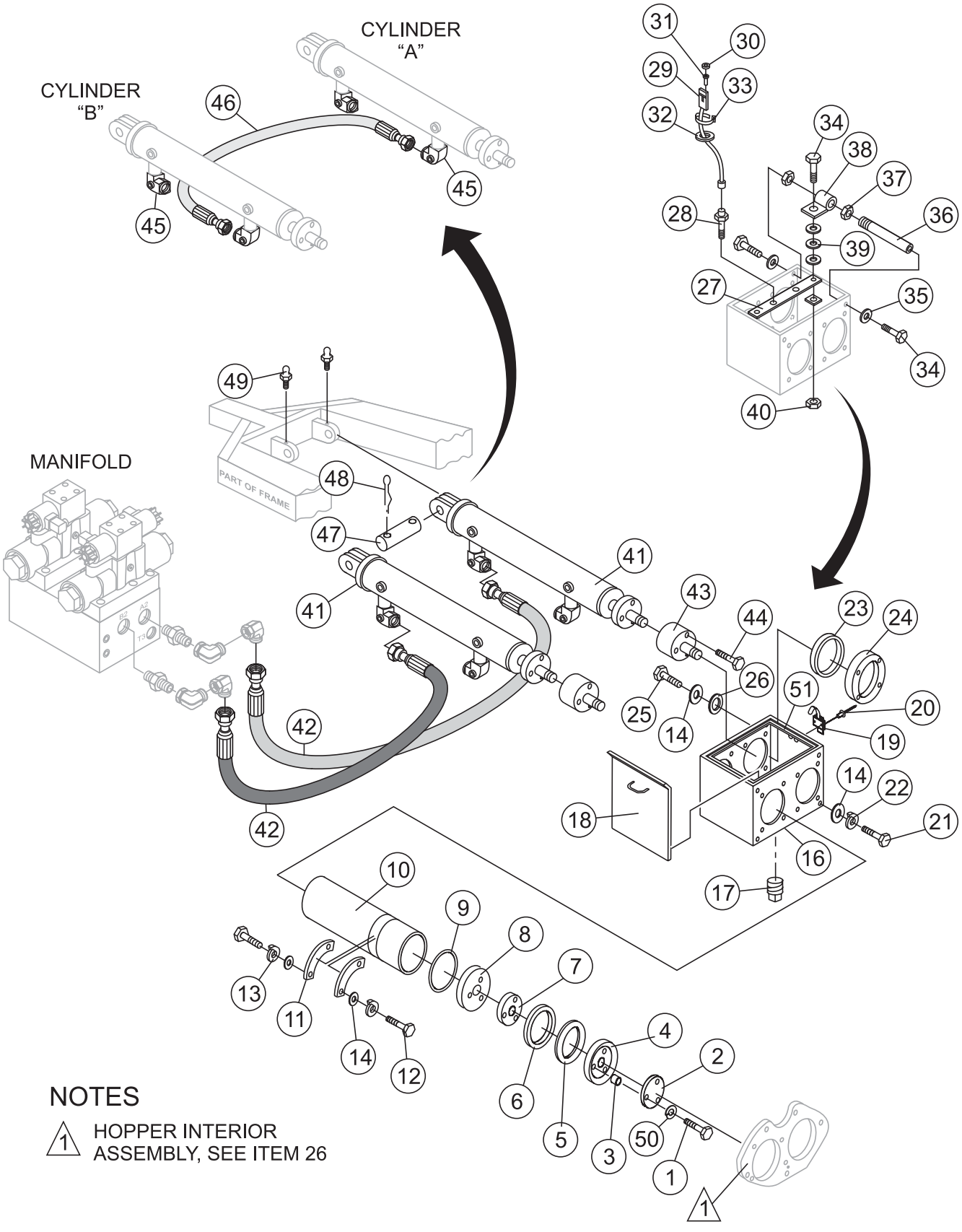
LS600 PUMP — HOPPER INTERIOR ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM16145A	SWING AXLE BUSHING	2	
2	EM284	STUD 1 IN. - 14 UNF	1	
3	EM16175	O-RING	1	
4	EM16170	RING SEAL, SHUTTLE AXLE	1	
5	EM16176	O-RING	1	
6	EM98022	WEAR RING HF	1	
6A	EM16816-1A	RING, ENERGIZER RUBBER	1	
7	EM16816-2	RING, INSERT STEEL	1	
8	EM16804	SLEEVE 5 IN.	1	JUNE 2008 AND BELOW
8	EM16804A	SLEEVE 5 IN.	1	JULY 2008 AND ABOVE
9	EM104	BOLT 5/8 X 2 IN.	4	REPLACES 503982
10	EM923348	WASHER, LOCK 5/8 IN.	4	
11	EM25803	DISCHARGE PLATE BEARING	1	
12	EM98065	SEAL, RUBBER	1	
13	EM512212	DISCHARGE NIPPLE	1	
14	491701	GREASE FITTING	3	
15	EM210	BOLT 5/8 X 2 IN.	6	
16	6109180	WASHER 1/2"	6	REPLACES 492626
17	EM16811	SHUTTLE CYLINDER	1	
18	EM25843	NUN PLATE	1	
19	EM104	BOLT, HEX HEAD 5/8 X 2 IN.	4	REPLACES 503982
20	491719	PIN	1	
21	EM923348	WASHER, LOCK 5/8 IN.	4	
25	EM514357	HOPPER SCREEN	1	
26	EM98021	PLATE, WEAR HF	1	
27	EM969023	NUT, HEX 5/8 IN. NC INS.	2	REPLACES 492586
28	EM265	BOLT, COUNTER SUNK 5/8-11 x 3 IN.	2	
29	EM923350	WASHER, LOCK 3/4 IN.	2	REPLACES EM492628
30	EM151	BOLT, HEX HEAD 3/4-10 X 2 IN.	2	
31	EM264	BOLT, COUNTER SUNK 1/2-13 x 3 IN.	2	
32	EM517700	O-RING	2	


MANIFOLD
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LS600 PUMP — SHUTTLE CYLINDER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM16145	SWING AXLE BUSHING	2	
2	EM510684	GREASE FITTING	1	
3	EM16169	THRUST WASHER	1	
4	EM25236	SHUTTLE CRANK, SPLINED SHAFT	1	
5	EM505490	GREASE FITTING	2	
6	EM16814	TENSIONER	1	
7	EM424	HEX NUT 1 IN. 14NF	1	
7A	EM924006	COTTER PIN 5/32 X 2 IN.	1	
8	EM417	NUT 1 IN. 14NF	1	
9	EM98106	SHUTTLE CYLINDER ASSY.	1	INCLUDES ITEMS W/*
9A	EM98106SK	SEAL KIT, SHUTTLE CYLINDER	1	
10*	EM254549	BRACKET, PIVOT	1	
11	492397	BOLT 1/2 X 2-1/2 IN.	4	
12	EM621	WASHER 1/2 IN.	4	
13	6109180	WASHER, LOCK 1/2 IN.	4	REPLACES 492626
14	492584	NUT 1/2 IN.	4	
15*	0820270000	CLEVIS PIN 3/4 IN.	2	
16*	0820270000	COTTER PIN	2	
18*	515249	JAM NUT	1	
19*	0509440000	FEMALE CLEVIS	2	
20	3322	FITTING, ELBOW	2	
21	EM514590	HOSE	1	
22	EM514591	HOSE	1	
23	517742	COVER, SHUTTLE CYLINDER	1	
24	0202	BOLT	3	REPLACES 492364
25	EM923023	WASHER, FLAT	3	REPLACES 492597
26	2105164	NUT, HEX	3	REPLACES 492582



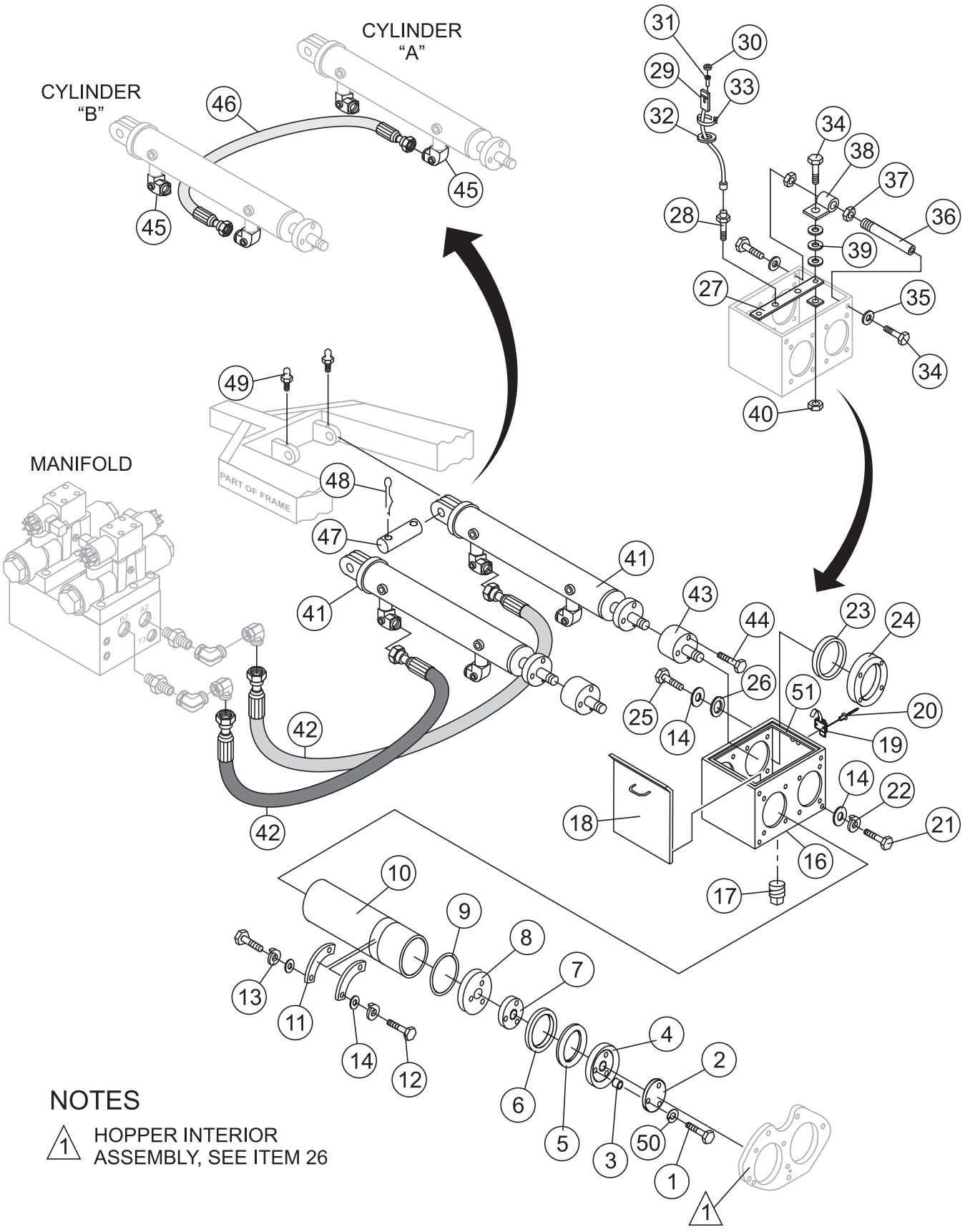
NOTES

1 HOPPER INTERIOR ASSEMBLY, SEE ITEM 26

LS600 PUMP — LUBRICATION PISTONS ASSY.

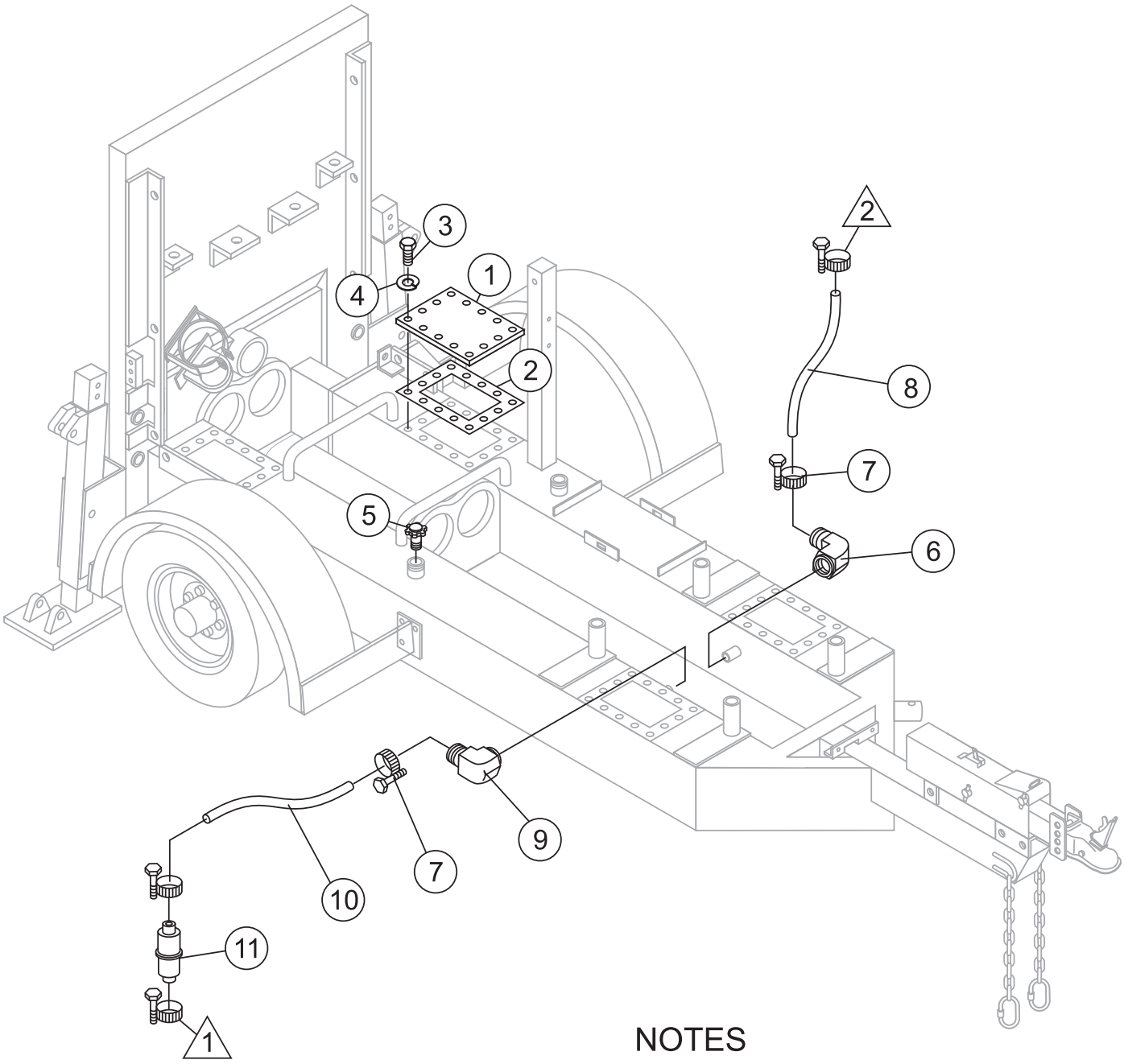
NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM510265	BOLT, HEX HEAD 3/8 NC X 3-1/2 IN., BLACK OXIDE G8	6	
2	EM16464	FACE PLATE	2	
3	EM16465	PISTON CUP SPACER	6	
4	EM98050	CUP, PISTON- ORANGE	2	
5	EM14408	RING, BRONZE	2	
6	EM16493	RING, FELT	2	
7	EM16462	FELT HOLDER	2	
8	EM16461	OILER PLATE	2	
9	EM14407	O- RING, OILER PLATE	2	
10	EM25801	CYLINDER, CONCRETE	2	
11	EM25110	RETAINER, CYLINDER	4	
12	EM963610	BOLT, 3/8 NC X 1.3/4 IN. G5	8	REPLACES 492375
13	0166 A	WASHER LOCK 3/8 IN.	8	REPLACES 492624
14	3019092	WASHER, FLAT 3/8 IN.	22	REPLACES 492598
16	EM514197	LUBRICATION BOX	1	
17	EM507895	PLUG	1	
18	EM515796	COVER, LUBRICATION BOX	1	
19	EM514610	LATCH, COVER	1	
20	491754	RIVET, AM-66	2	
21	492378	BOLT, 3/8 NC X 1.3/4 IN. G5	6	
22	0166 A	WASHER, LOCK 3/8”	6	REPLACES 492624
23	EM274351	SEAL LUBE BOX	2	
24	EM50425	FLANGE, RING	2	
25	492451	BOLT 3/8 - 24 X 1 IN. HEX HEAD	8	
26	EM50443	SEAL, OIL BOX	8	
27	514208	BAR,PROXIMITY SWITCH SUPPORT	1	
28	EM98163	SWITCH, PROXIMITY W/CABLE	2	
29	EM98135	CABLE HOUSING, FEMALE	2	
30	EM98134	SEAL, CONNECTOR HOUSING	6	
31	EM98138	TERMINAL PIN, FEMALE	6	
32	514611	GROMMMET	2	
33	504505	WRAP TIE	8	

LS600 PUMP — LUBRICATION PISTONS ASSY.



LS600 PUMP — LUBRICATION PISTONS ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
34	492366	BOLT, HEX HEAD 5/16 NC X 1 IN. G5	6	
35	EM492623	WASHER, LOCK 5/16 IN.	4	
36	EM514216	ADJUSTMENT ROD, PROXIMITY SWITCH	2	
37	EM492556	NUT, HEX 1/2 IN.	4	
38	EM514207	BRACKET, ADJUSTMENT ROD	2	
39	EM492597	WASHER, FLAT 5/16 IN.	6	
40	EM492582	NUT, HEX HEAD 5/16 IN	2	
41	EM98211	CYLINDER, MAIN	2	
42	EM514920	HOSE, MAIN HYD. CYLINDER	2	
43	EM514202	EXTENSION, SPACER	2	
44	EM185	BOLT, SOCKET HEAD 3/8 NC X 3 IN., BLACK OXIDE G8	6	
45	EM25497	FITTING, 90°	4	
46	EM25474	HOSE, HYDRAULIC SLAVE	1	
47	EM16459	PIN, WRIST	2	
48	EM505723	PIN, COTTER	4	
49	EM491701	FITTING, GREASE	2	
50	EM517126	LOCK WASHER	6	
51	EM513352	SEAL, SQUARE	1	



NOTES

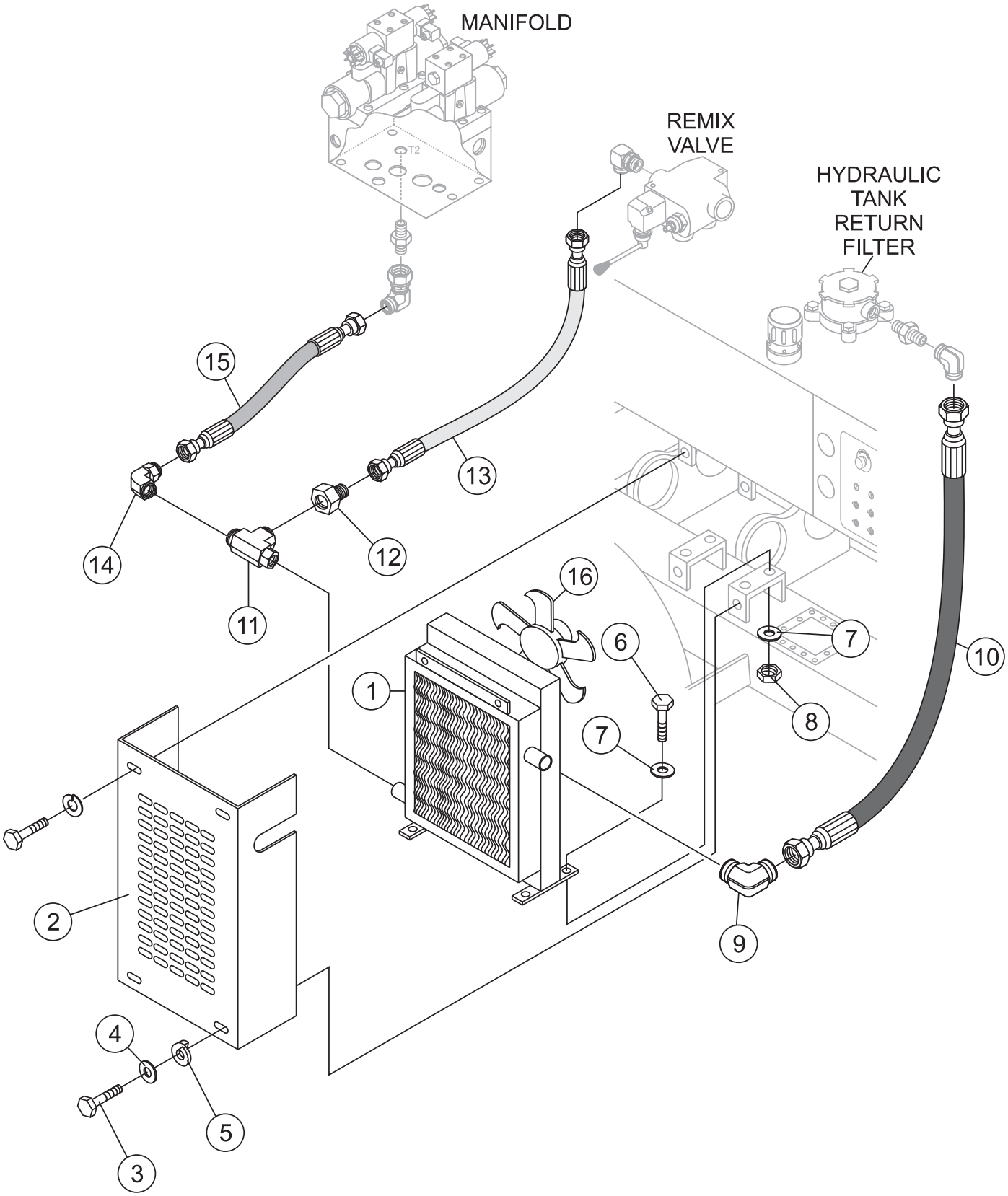
1 CONNECT TO FILTER INLET HOSE WATER SEPARATOR ASSY., NOTE 1

2 CONNECT TO FILTER OUTLET HOSE WATER SEPARATOR ASSY., NOTE 2

LS600 PUMP — FUEL TANK ASSY.

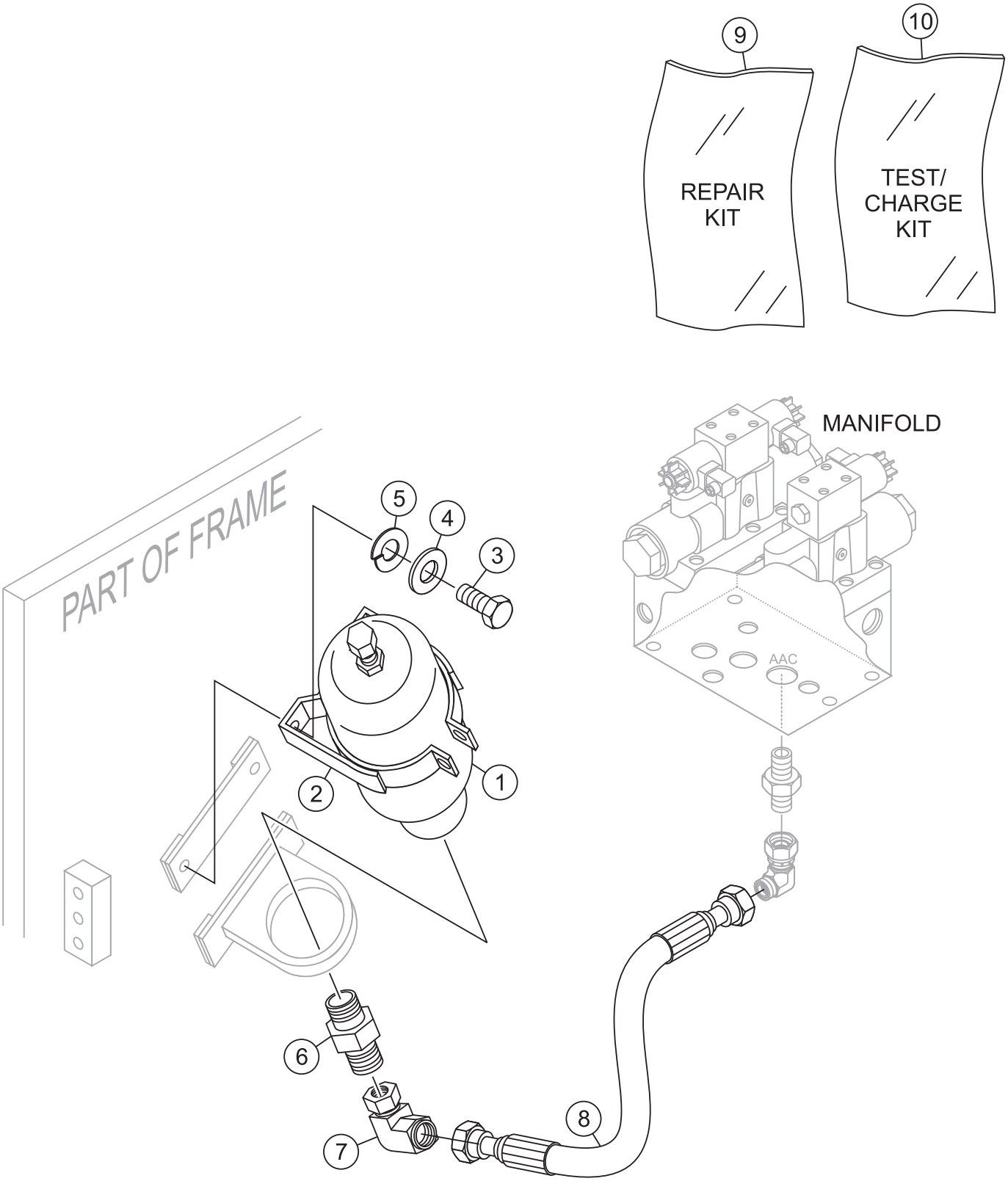
NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM514084	COVER, DIESEL TANK	4	
2	514080	GASKET	4	
3	492362	BOLT 5/16 X 5/8 IN.	56	
4	EM923343	WASHER, LOCK 5/16 IN.	56	 REPLACES 492623
5	34507	CAP, FUEL W\GAUGE	1	
6	EM514559	ADAPTOR	1	
7	506208	CLAMP	5	
8	EM514536	HOSE, FUEL RETURN 5/16 IN.	A/R	
9	EM20426	ADAPTER	1	
10	EM514536	HOSE, FUEL FILTER 5/16 IN.	A/R	
11	EM20763	FILTER, FUEL	1	

LS600 PUMP — HEAT EXCHANGER ASSY.



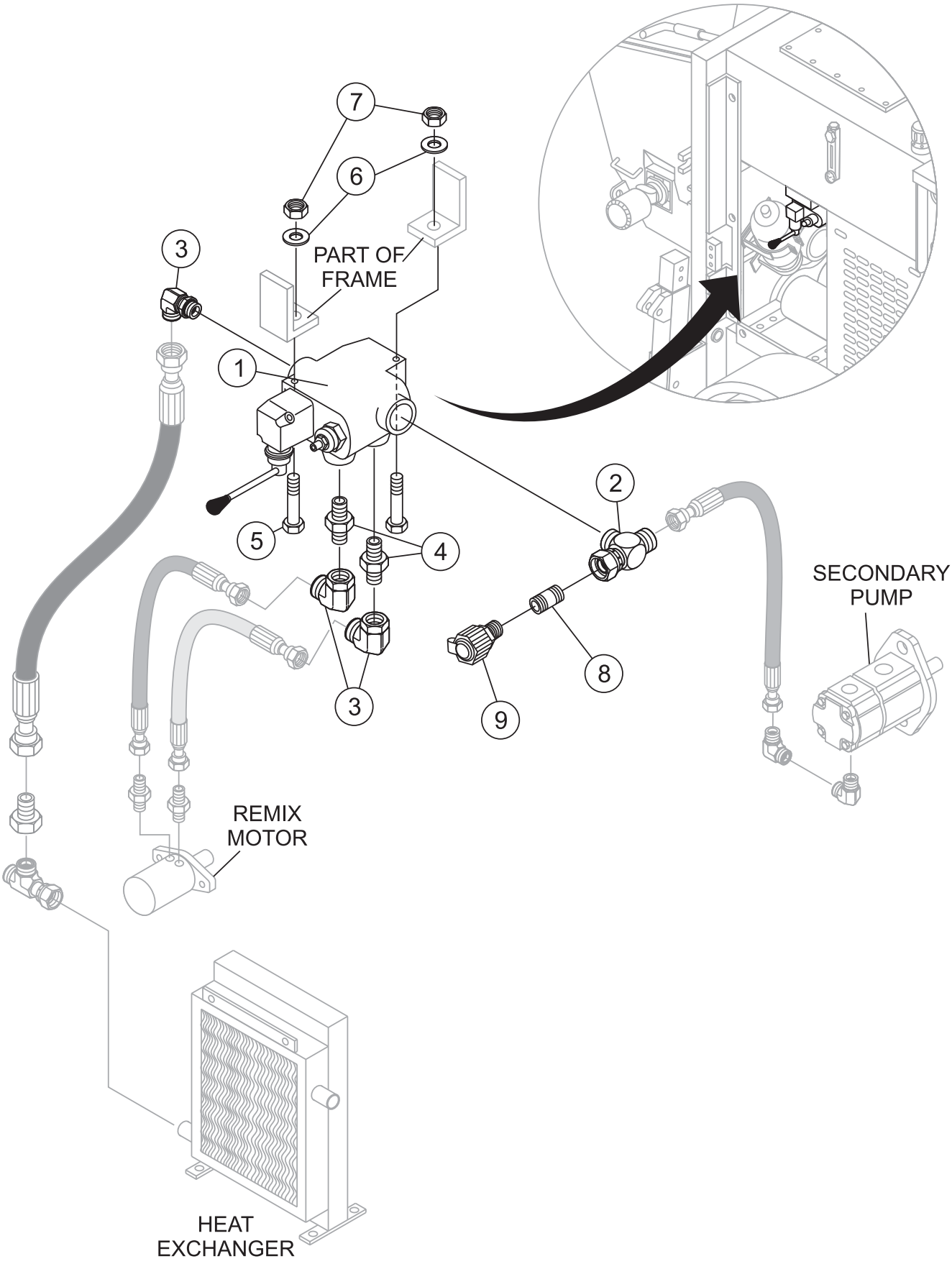
LS600 PUMP — HEAT EXCHANGER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM98118	HEAT EXCHANGER ASSY.	1	
2	EM514175	COVER, HEAT EXCHANGER	1	
3	EM963610	BOLT 3/8 IN. X 1 IN.	4	REPLACES 492375
4	3019092	O-RING 3/8 IN.	4	REPLACES 492598
5	0166 A	WASHER, LOCK 3/8 IN.	4	REPLACES 492624
6	0202	BOLT 5/16 X 1 IN.	4	REPLACES 492364
7	EM923023	WASHER, FLAT 5/16 IN.	8	REPLACES 492597
8	2105164	NUT 5/16 IN.	4	REPLACES 492582
9	EM25497	ADAPTER	1	
10	EM514607	HOSE 4000 PSI	1	
11	EM25566	ADAPTER	1	
12	EM509345	ADAPTER	1	
13	EM514606	HOSE 2000 PSI	1	
14	EM509401	ADAPTER	1	
15	EM514604	HOSE, 2000 PSI	1	
16	EM98264	MOTOR AND FAN ASSY	1	


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REPAIR KIT
TEST/ CHARGE KIT
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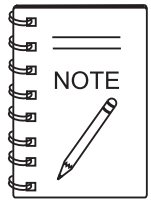
LS600 PUMP — ACCUMULATOR ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM97015	ACCUMULATOR 1 GAL.	1	
2	EM97016	BRACKET, ACCUMULATOR	1	
3	EM9603055	BOLT, HHCS 3/8 IN. DIA.	2	
4	3019092	WASHER, FLAT 3/8 IN.	2	
5	0166A	WASHER, LOCK 3/8 IN. DIA.	2	
6	EM509425	FITTING, STRAIGHT	1	
7	EM509353	FITTING, 90° ELBOW	1	
8	EM514603	HOSE, ACCUMULATOR	1	
9	EM98009	ACCUMULATOR REPAIR KIT	1	
10	EM98052	ACCUMULATOR TEST/CHARGE KIT	1	

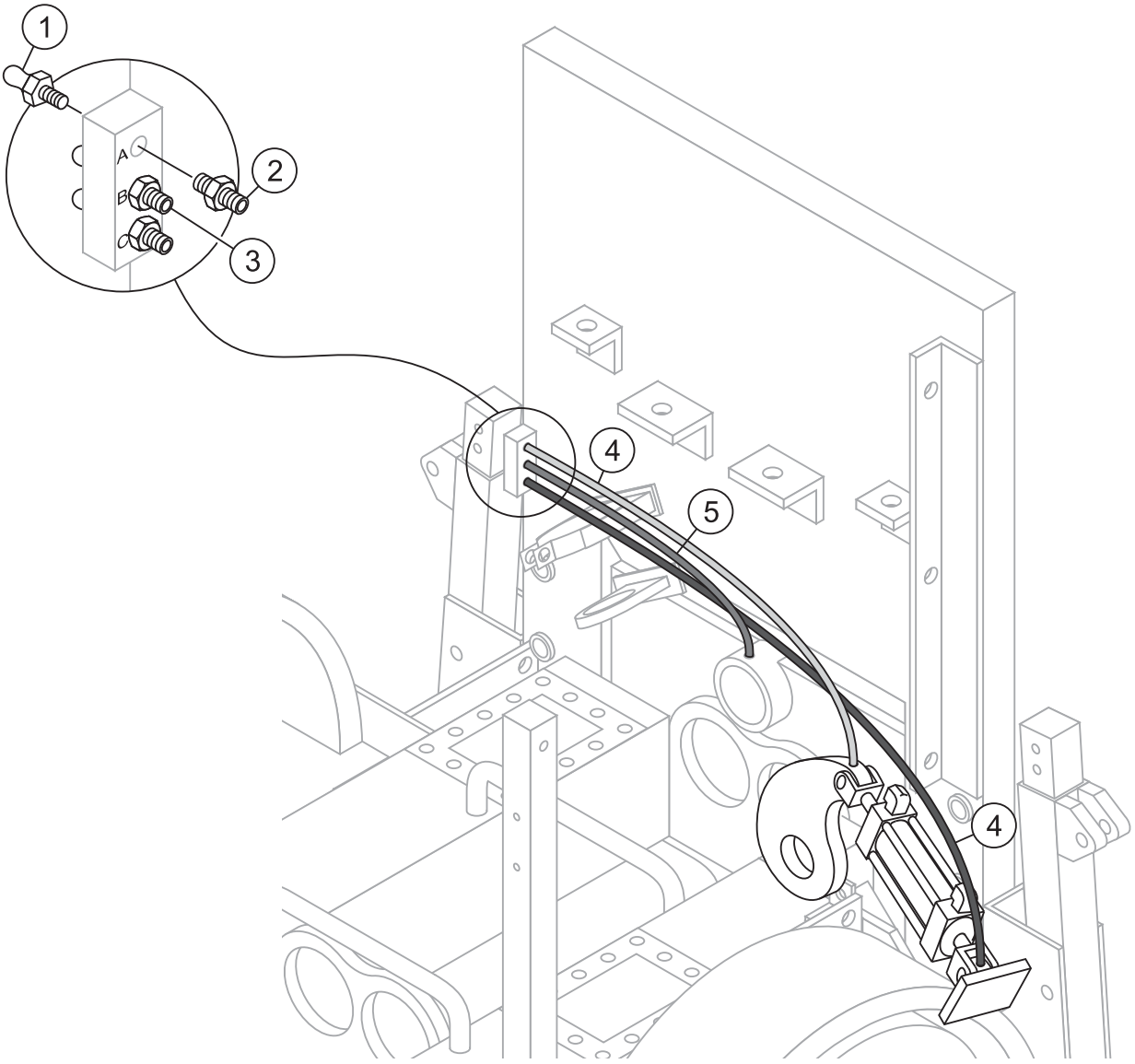

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PART OF
FRAME
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SECONDARY
PUMP
REMIX
MOTOR
HEAT
EXCHANGER

LS600 PUMP — REMIXER CONTROL ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM25495	VALVE REMIXER W/ LEVER	1	
2	515384	ADAPTER FITTING, T	1	
3	506195	ADAPTER FITTING, 90° ELBOW	1	
4	EM25509	ADAPTER FITTING, STRAIGHT	2	
5	EM218	BOLT 5/16 X 2-1/2 IN.	2	
6	EM923343	WASHER, LOCK 5/16 IN.	2	REPLACES 492623
7	2105164	NUT, HEX 5/16 IN.	2	REPLACES 492553
8	EM98015	COUPLING	1	
9	EM98014	TEST PORT	1	



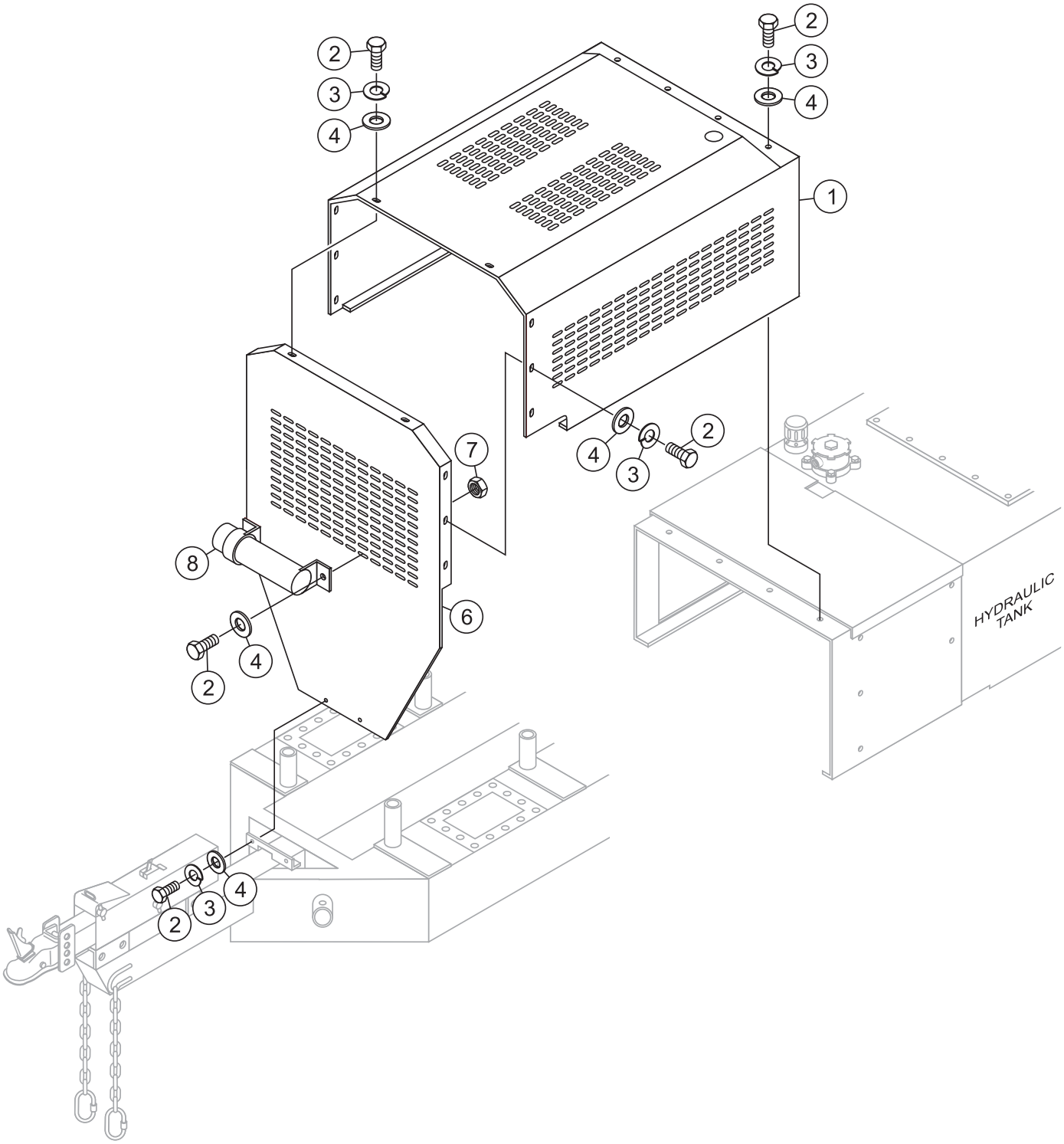
Grease daily, two or three hots of #2 multipurpose automotive grease. Over greasing any bearing will not damage the machine. **ALWAYS** grease ***before and after*** pump operation.



POSITION	LOCATION	LENGTH OF LINES
A	CLEVIS GREASE POINT	34 in. (1.1 m)
B	SWING AXLE BUSHING GREASE POINT	26 in. (.85 m)
C	PIVOT BRACKET GREASE POINT	41 in. (1.5 m)

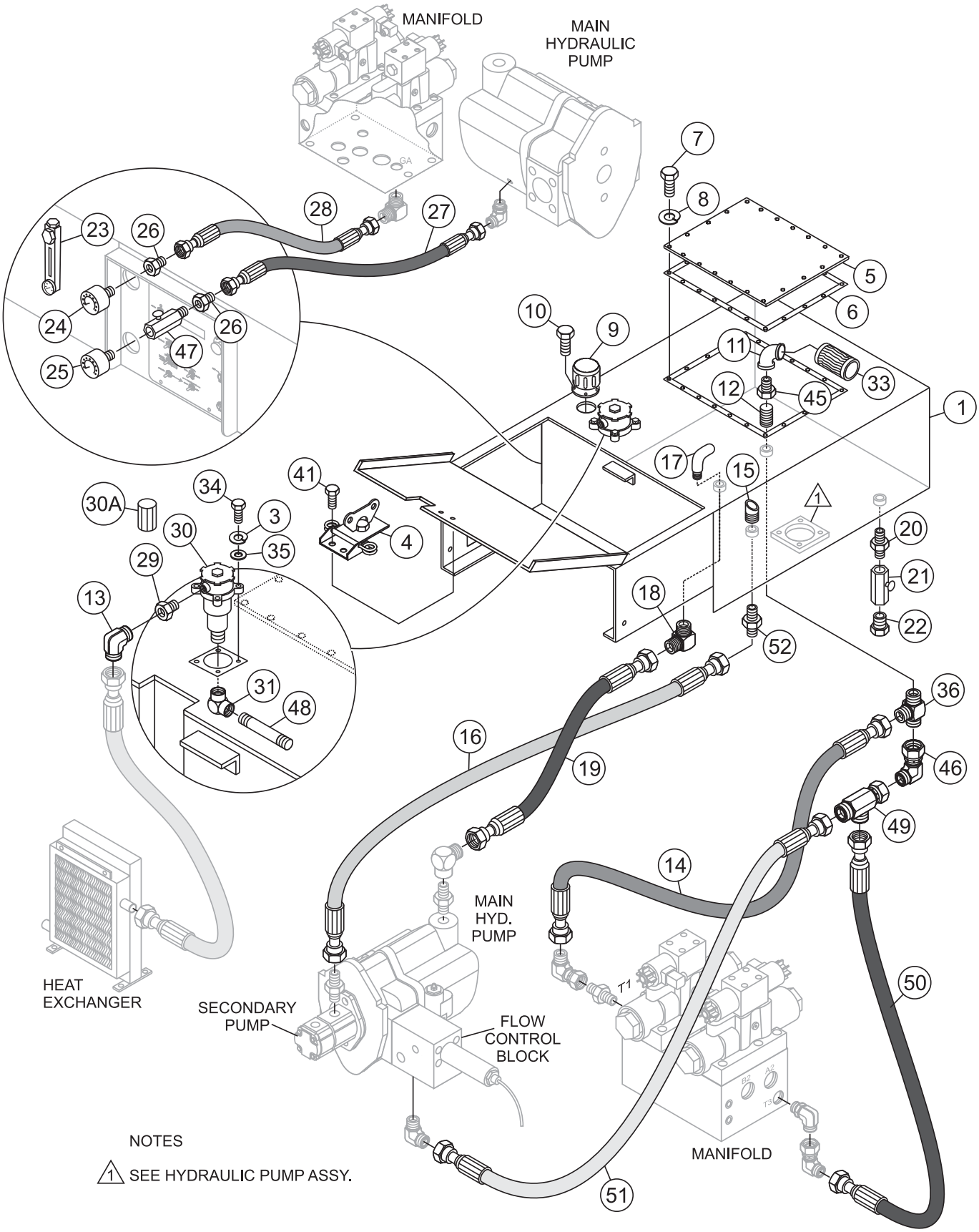
LS600 PUMP — LUBRICATION PANEL

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM491701	GREASE FITTING	3	
2	EM508812	CONNECTOR	2	
3	EM510684	CONNECTOR	3	
4	EM505516	HOSE, PLASTIC	A/R	
5	EM510487	HOSE, STEEL	1	

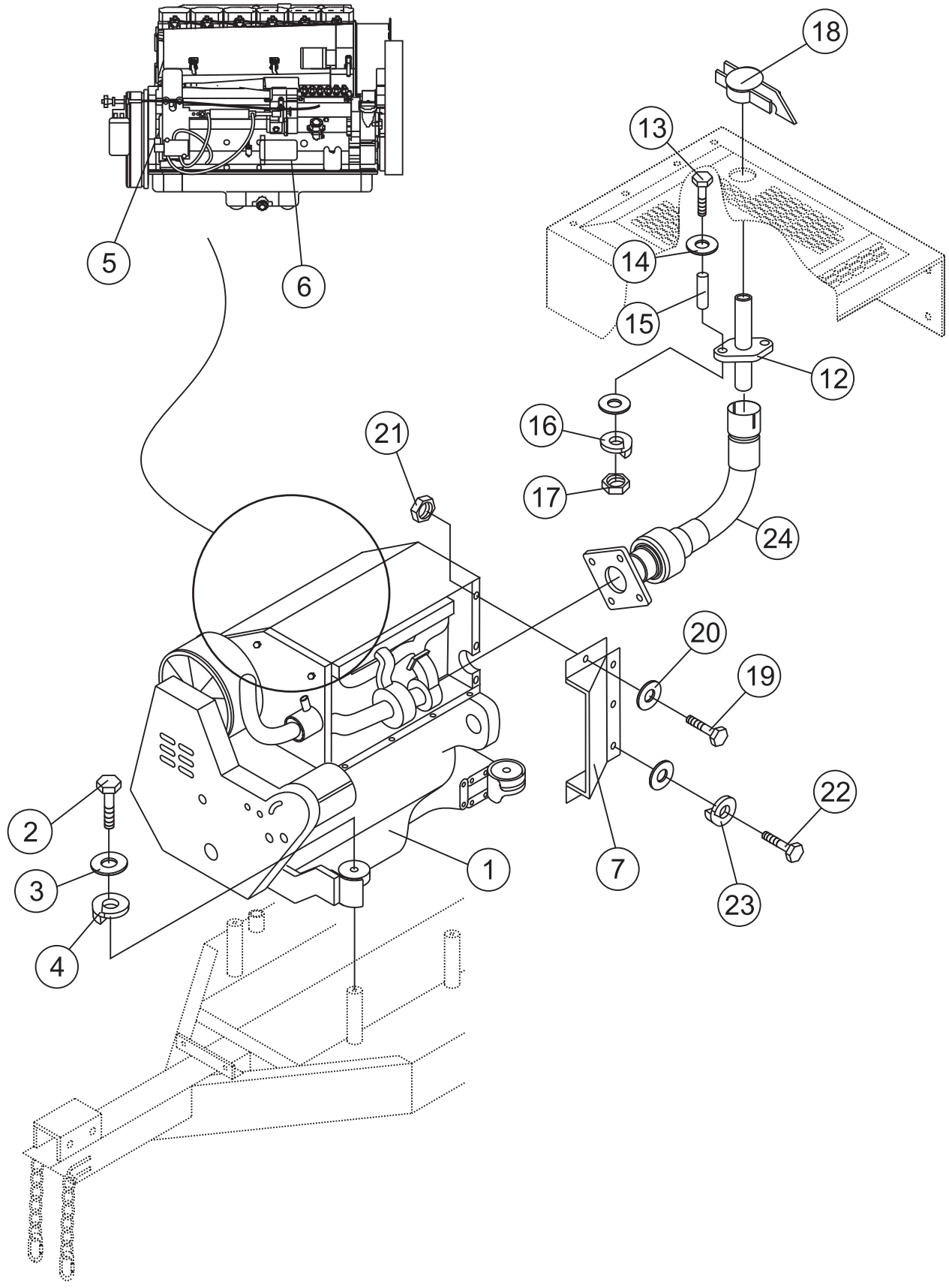

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HYDRAULIC TANK

LS600 PUMP — ENGINE COVER ASSY.

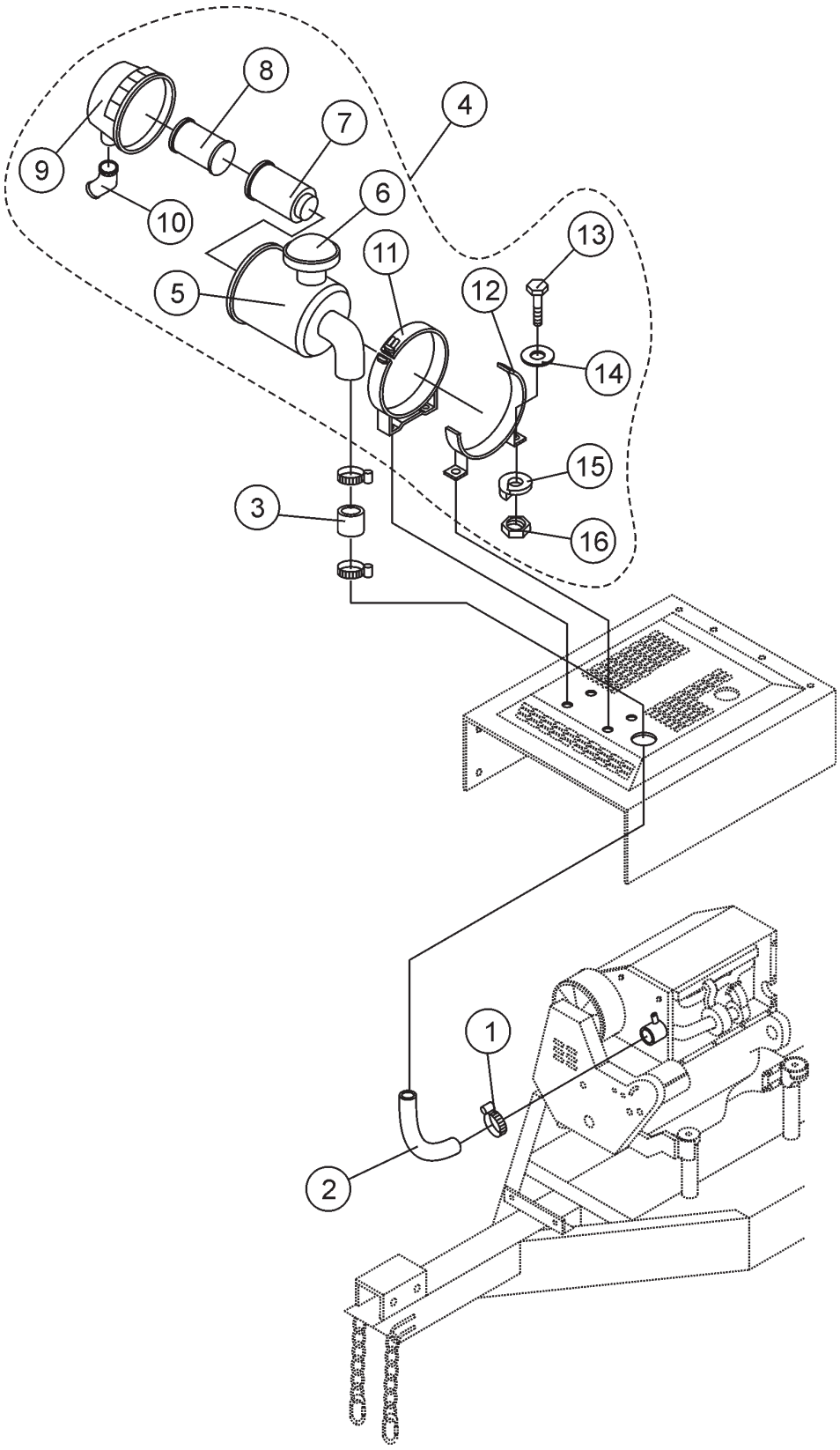
NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM517737	COVER, TOP	1	
2	492356	BOLT 1/4" NC X 3/4" G5	16	
3	EM923057	LOCK WASHER 1/4 IN.	14	REPLACES 492596
4	2101402	WASHER 1/4 IN.	16	REPLACES 492622
6	EM517730	COVER, FRONT ENGINE	1	
7	492541	NUT 5/16" NC G2	2	
8	TK6737260	DOCUMENT BOX	1	


MANIFOLD
MAIN HYDRAULIC PUMP
MAIN HYD. PUMP
SECONDARY PUMP
FLOW CONTROL BLOCK
HEAT EXCHANGER
MANIFOLD
NOTES
1 SEE HYDRAULIC PUMP ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	514040	HYDRAULIC TANK, LS-S	1	
3	0166 A	LOCK, WASHER 3/8 IN.	4	REPLACES 492624
4	EM517295	LATCH	1	
5	EM251191	TANK COVER PLATE	1	
6	EM25184	RESERVOIR GASKET	1	
7	492362	BOLT 5/16 X 5/8 IN.	20	
8	EM923343	WASHER, LOCK 5/16 IN.	20	REPLACES 492623
9	EM98263	CAP ASSEMBLY	1	
10	492267	BOLT 3/16 X 5/8 IN.	6	
11	16433	TUBE	1	
12	EM491189	FITTING	1	
13	EM18436	90° MALE ADAPTER 2103-16-16	1	
14	EM514605	HOSE	1	
15	EM514622	FITTING 1 IN.	1	
16	EM514597	HOSE	1	
17	EM491164	ELBOW, 3/4 IN.	1	
18	509784	ADAPTER	1	
19	517002	HOSE	1	
20	EM509369	STRAIGHT MALE ADAPTOR , 0101-08-08	1	
21	491237	VALVE 1/2 IN.	1	
22	506094	CAP 1/2 IN.	1	
23	EM98188	GAUGE, LEVEL & TEMP.	1	REPLACES EM16478
24	EM97066	GAUGE 3000PSI, ACCUMULATOR	1	
25	EM97067	GAUGE 5000 PSI, MAIN	1	
26	EM25523	ADAPTER	2	
27	EM509517	HOSE, 4000 PSI MAIN GAUGE	1	
28	EM514602	HOSE, 4000 PSI ACCUMULATOR GAUGE	1	
29	EM16517	STRAIGHT MALE ADAPTER 0102-24-16	1	
30	EM98112A	FILTER RETURN ASSY.	1	S/N 281101 AND BELOW
30A	EM98275	ELEMENT, RETURN FILTER	1	S/N 281102 AND ABOVE
31	516814	90° FITTING	1	
33	EM16513	DIFFUSER	1	
34	492376	BOLT 3/8 X 1-1/4 IN.	4	
35	492598	WASHER, FLAT 3/8 IN.	4	
36	509343	TEE FITTING	1	
41	TBD	BOLT	2	
45	516813	BUSHING	1	
46	409401	ADAPTOR 3903-16-16	1	
47	EM16414	VALVE NEEDLE	1	
48	16516	PIPE 1-1/2"	1	S/N 281101 AND BELOW
49	509344	ADAPTOR 063T-16-16	1	
50	514604	HOSE	1	
51	514604	HOSE	1	
52	517029	FITTING, STRAIGHT	1	

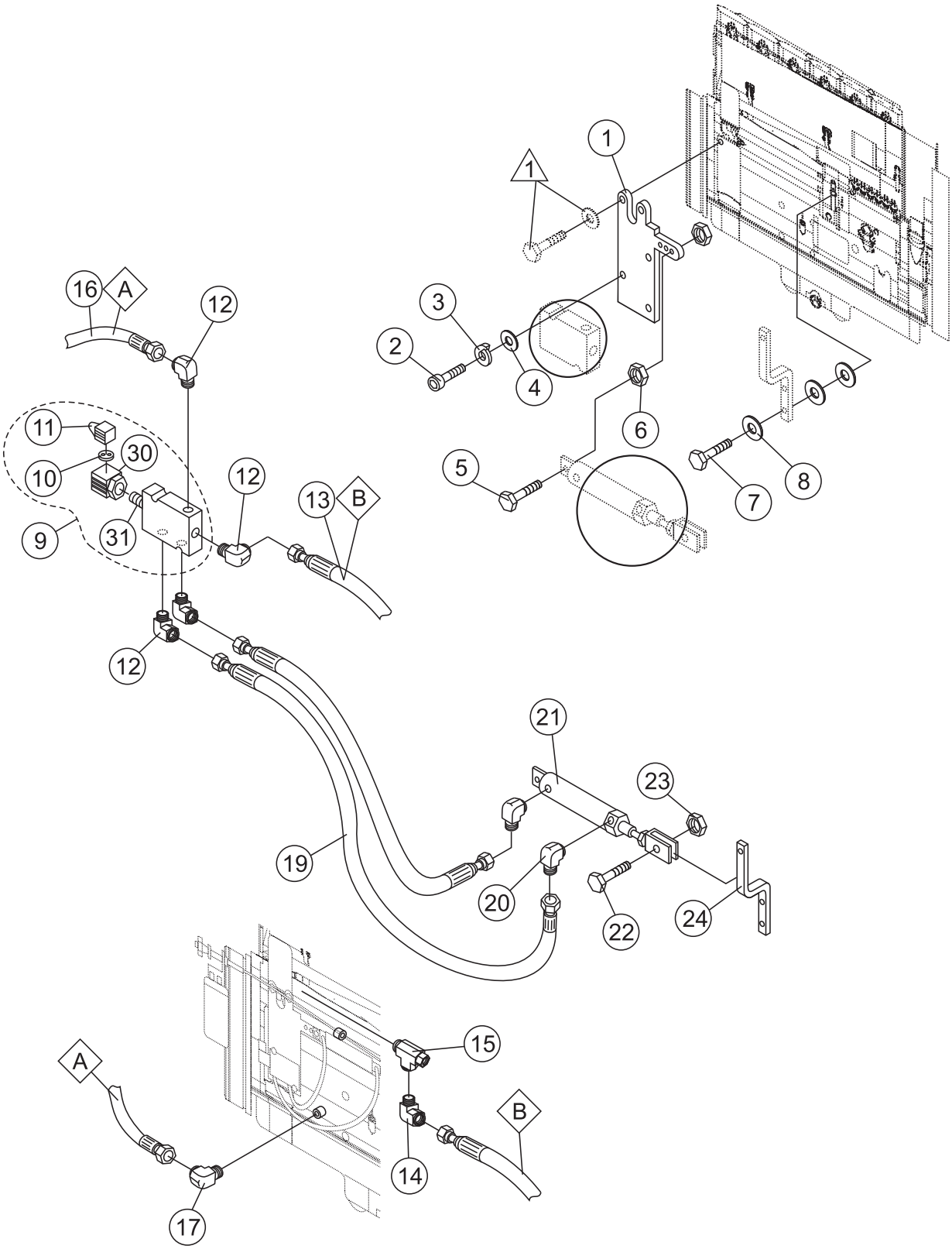

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NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM98197	ENGINE, DEUTZ TURBO 110 HP BF4L914	1	
2	492401	BOLT1/2 IN.X 4 FT.	4	
3	6109170	WASHER, FLAT 1/2 IN.	4	REPLACES 492600
4	6109180	WASHER, LOCK 1/2 IN.	4	REPLACES 492626
5	01174416	FILTER, OIL (ENGINE)	1	
6	01174696	FILTER, FUEL (ENGINE)	1	
7	EM513776	DEFLECTOR	1	
12	EM514633	REDUCTION TUBE, EXHAUST	1	
13	492371	BOLT 5/16 NC X 3 IN. G5	2	
14	EM923023	WASHER, FLAT 5/16 IN.	4	REPLACES 492597
15	EM514714	SPACER, EXHAUST	2	
16	EM923343	WASHER, LOCK 5/16 IN.	2	REPLACES 492623
17	2105164	HEX NUT 5/16 IN. G5	2	REPLACES 492553
18	EM510897	CAP, EXHAUST 2-1/2 IN.	1	
19	0202	BOLT 5/16 X 1 IN.	2	REPLACES 492364
20	EM923023	WASHER, FLAT 5/16 IN.	7	REPLACES 492597
21	2105164	NUT, HEX 5/16 IN.	3	REPLACES 492582
22	EM506886	BOLT M8 X 20 X 1-1/4 IN.	3	
23	EM923343	WASHER, LOCK 5/16 IN.	4	REPLACES 492623
24	EM516435	PIPE, EXHAUST	1	

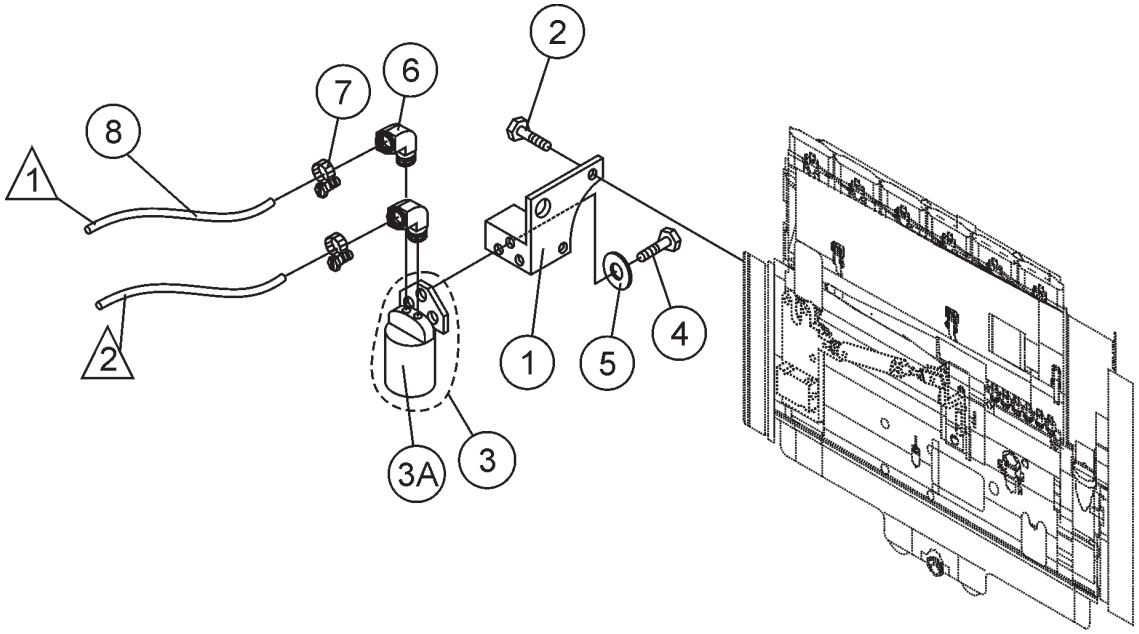

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LS600 PUMP — ENGINE AIR FILTER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM493108	CLAMP	3	
2	513227	AIR FILTER HOSE 3-1/2 IN.	.5	
3	EM514367	TUBE AIR FILTER UNION	1	
4	EM98093	AIR CLEANER ASSY.	1	INCLUDES ITEMS W/*
5*		FILTER, AIR	1	NOT SOLD SEPARATELY
6*	EM98207	CAP, RAIN	1	
7*	EM98093P	ELEMENT, PRIMARY	1	
8*	EM98093S	ELEMENT, SECONDARY	1	
9*		HOOD, AIR CLEANER	1	NOT SOLD SEPARATELY
10*		DUST EJECTOR	1	NOT SOLD SEPARATELY
11*		ADJUSTABLE SUPPORT, AIR FILTER	1	NOT SOLD SEPARATELY
12*		SUPPORT, AIR FILTER	1	NOT SOLD SEPARATELY
13*	492357	BOLT, HEX HEAD 1/4 X 1 IN.	4	
14*	EM923057	WASHER, FLAT 1/4 IN.	8	REPLACES 492596
15*	TBD	WASHER, LOCK 1/4 IN.	4	
16*	492581	NUT, HEX 1/4 IN.	4	


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NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM512837	SUPPORT BASE, ACCELERATOR	1	
2	EM492358	BOLT 1/4 X 1-1/4	2	
3	2101402	WASHER 1/4 IN.	2	REPLACES 492622
4	EM923057	LOCK WASHER 1/4 IN.	2	REPLACES 492596
5	512185	BOLT 1/4 X 1-3/4 IN.	1	
6	492581	HEX NUT 1/4 IN.	2	
7	EM506599	BOLT M6 X 15	2	
8	492622	WASHER, FLAT 1/4 IN.	4	
9	EM98168	THROTTLE BLOCK COUPLING	1	INCLUDES ITEMS W/*
10*	EM98167	SEAL CONNECTOR	1	
11*	EM98166	CONNECTOR, DIN PG9	1	
12	EM25429	ELBOW ADAPTER 90° MALE	4	
13	EM509937	HOSE, HYDRAULIC COMPENSATOR	1	
14	EM25577	ELBOW ADAPTER IN.T IN.	1	
15	EM50449	ELBOW ADAPTER 90 DEG. MALE	2	
16	TBD	HOSE	1	
17	TBD	FITTING	1	
19	EM509366	HOSE 13.75 IN. LONG	2	
20	EM50449	ELBOW ADAPTER 90° MALE	2	
21	EMCC700	HYDRAULIC CYLINDER	1	
22	492357	BOLT 1/4 IN. X 1 IN.	1	
23	492581	NUT 1/4 IN.	1	
24	515822	BRACKET, ACCELERATOR	1	
30	EM98228	COIL, 12V	1	
31	EM98232	CARTRIDGE VAL VE	1	

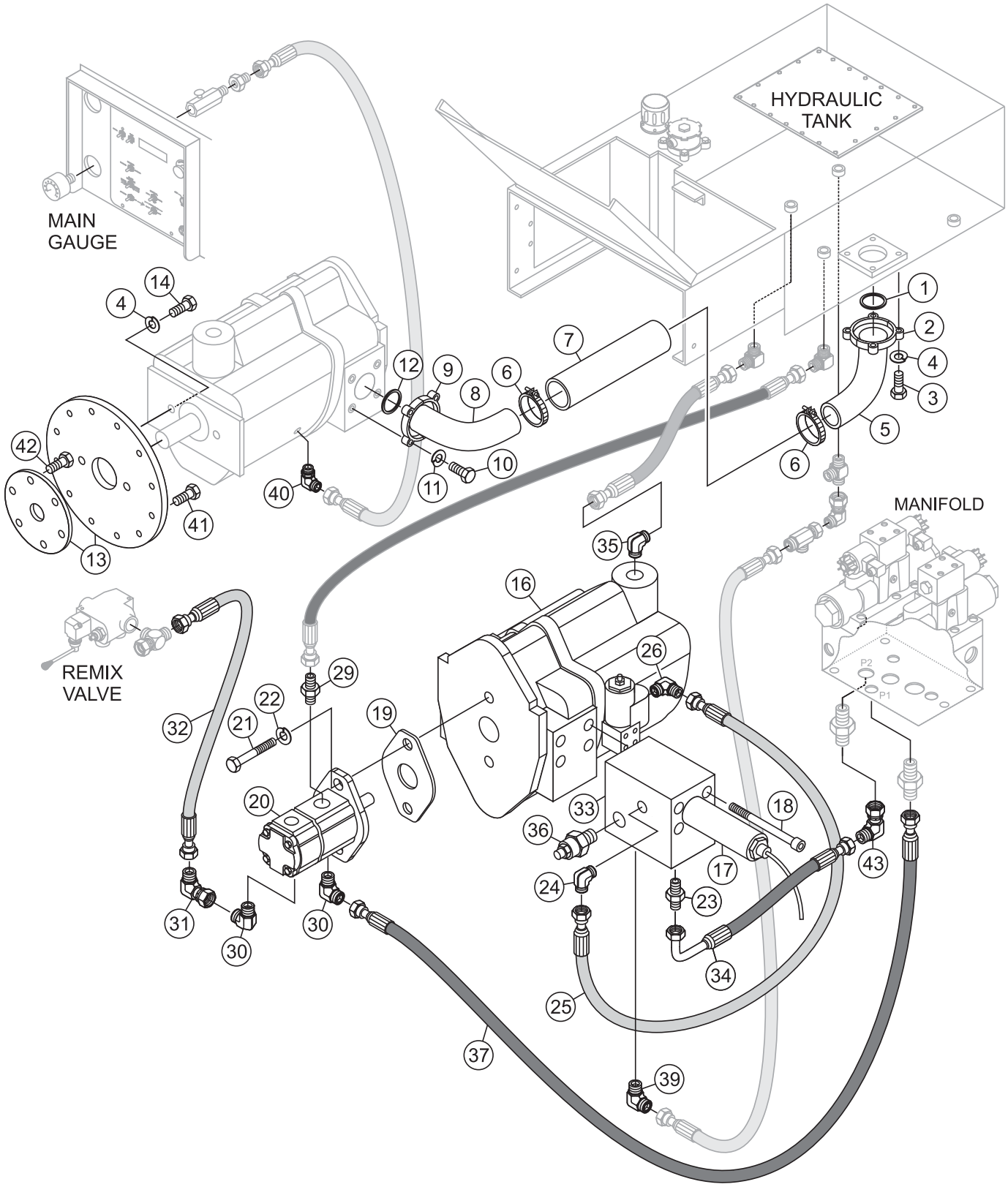


NOTES

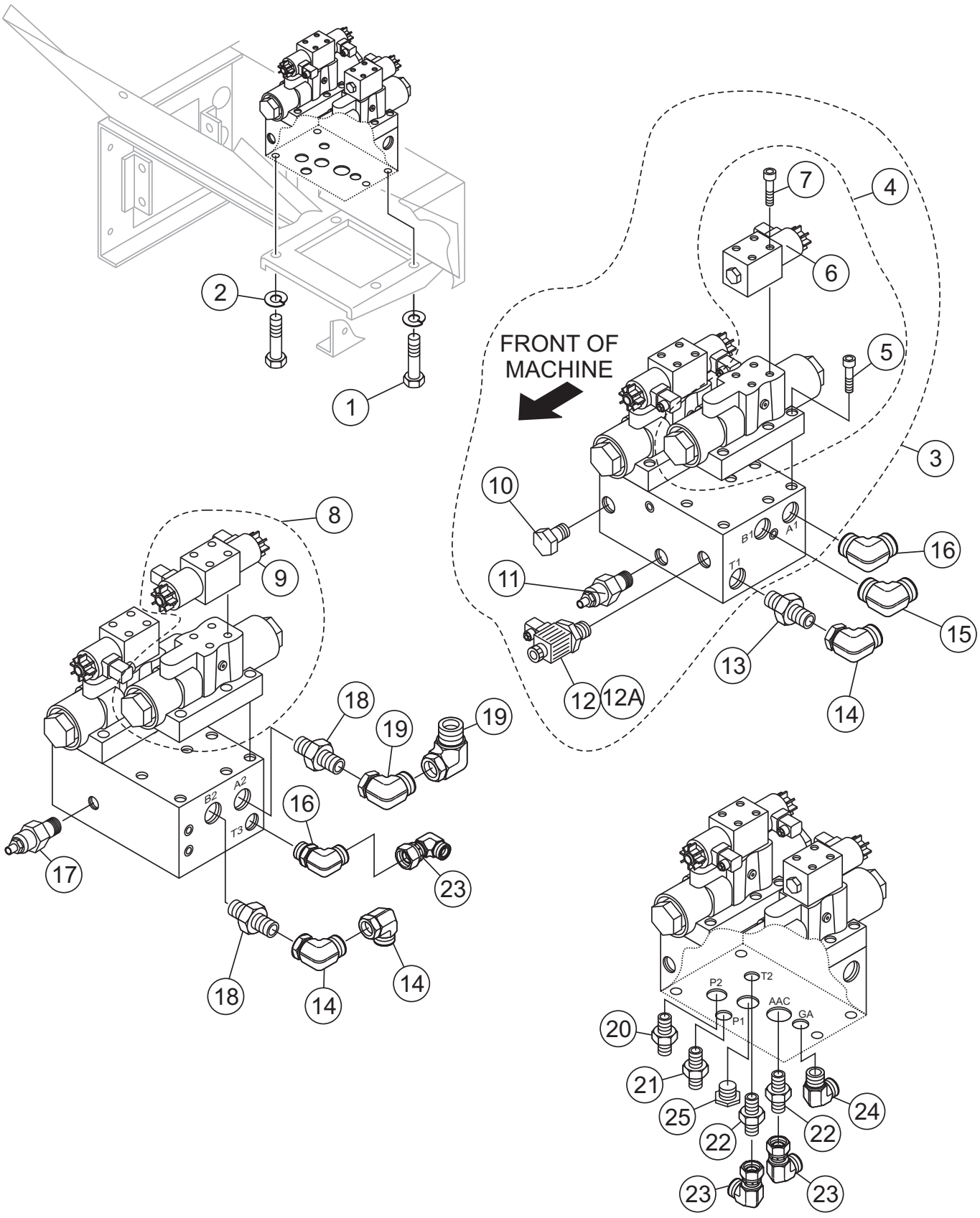
1. CONNECT TO FUEL FILTER FUEL TANK ASSY., ITEM 11
2. CONNECT TO FUEL RETURN HOSE FUEL TANK ASSY., ITEM 8

LS600 PUMP — WATER SEPARATOR ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM509449	BRACKET, WATER SEPERATOR	1	
2	EM492356	BOLT	2	
3	EM16747	WATER SEPERATOR ASSEMBLY	1	
3A	EM167472	CARTRIDGE, WATER SEPERATOR	1	REPLACES P53712
4	EM492356	BOLT 5/16 X 1 IN.	3	
5	2105164	HEX NUT 5/16 IN.	3	REPLACES 492582
6	C514559	ELBOW ADAPTER 90° MALE	2	
7	EM506208	CLAMP, HOSE	2	
8	EM514536	HOSE 5/16 IN.	TBD	

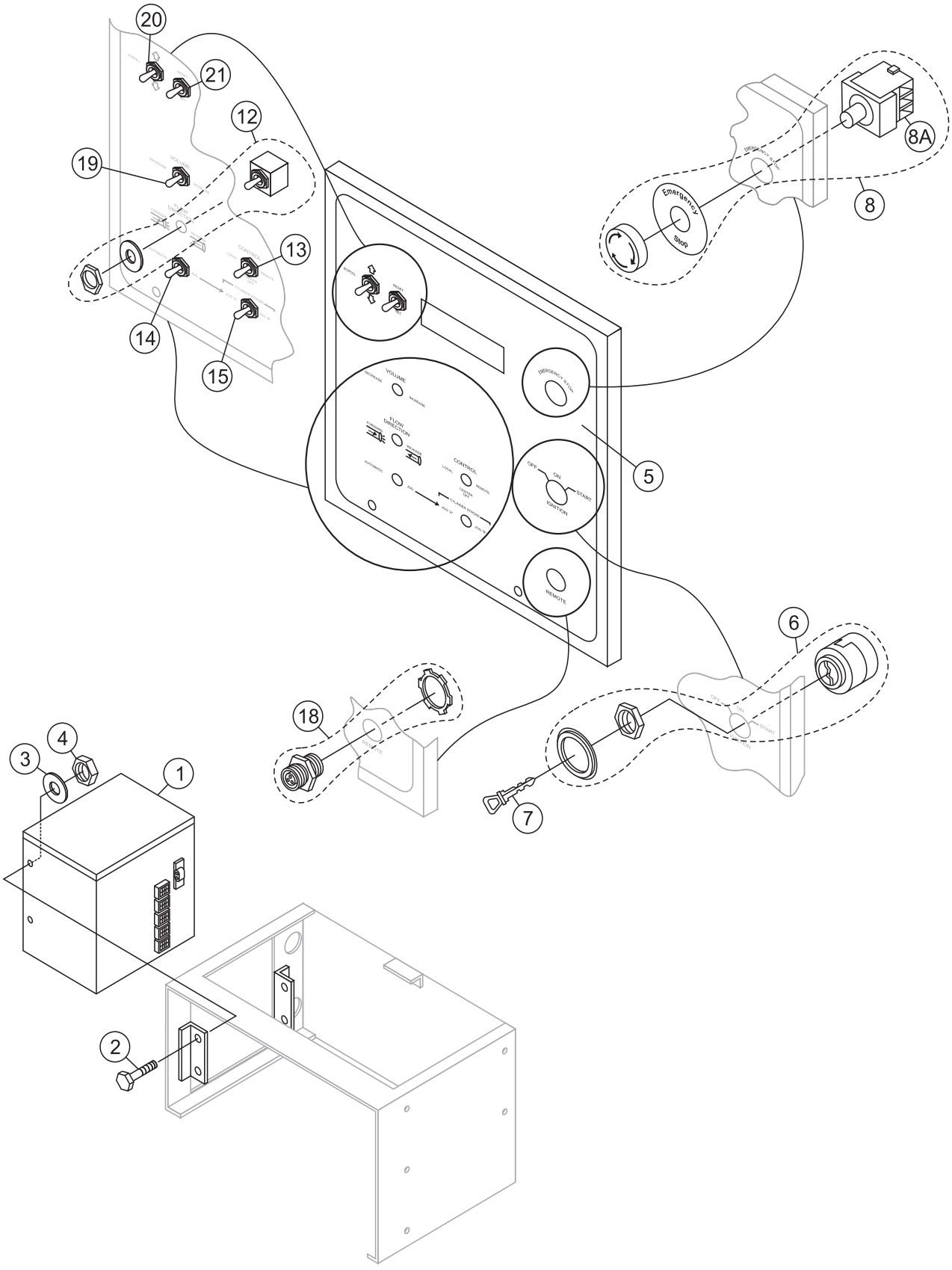

HYDRAULIC TANK
MAIN GAUGE
MANIFOLD
REMIX VALVE
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NO.	PART NO.	PART NAME	QTY.	REMARKS
1*	TBD	O-RING	1	
2	EM514719	FLANGE, SUCTION PIPE	2	INCLUDES ITEMS W/*
3	EM492444	BOLT 1/2 X 1-1/4 IN.	4	
4	6109180	WASHER, LOCK 1/2 IN.	6	REPLACES 492626
5	EM514718	SUCTION PIPE ADAPTER, 40 SPECIAL	1	
6	EM515207	CLAMP 2 IN.	2	
7	EM514623	HOSE, SUCTION 2 IN.	1	
8	EM514627	ADAPTER, SUCTION PIPE 32	1	
9	EM514628	FLANGE, SUCTION PIPE	1	INCLUDES ITEMS W/%
10	EM510902	BOLT 1/2 X 1-1/2 IN.	4	
11	6109180	WASHER, LOCK 1/2 IN.	4	REPLACES 492626
12%		O-RING	1	
13	EM516777	COUPLER, ENGINE ASSY.	1	
14	EM510902	BOLT 1/2 X 1-1/2 IN.	2	
16	EM98257	PUMP, MAIN 100CC, PARKER P1-100 SERIES	1	
17	EM98273	FLOW CONTROL VALVE, MOTORIZED	1	
18$	511428	SCREW ALLEN HEAD 1/2-13X3	4	
19	EM16190	GASKET	1	
20	EM98107	PUMP, SECONDARY	1	
21	EM963610	BOLT 3/8 X 1 IN.	2	REPLACES 492375
22	0166 A	WASHER, LOCK 3/8 IN.	2	REPLACES 492624
23	EM509796	STRAIGHT ADAPTER	1	
24	EM25429	ELBOW ADAPTER	1	
25	516875	HOSE, 4000 PSI SENSOR	1	
26	EM25429	ELBOW ADAPTER	1	
29	EM25498	STRAIGHT ADAPTER	1	
30	EM16524	ELBOW ADAPTER 90° MALE	2	
31	506200	ELBOW ADAPTER	1	
32	EM514601	HOSE 2000 PSI, REMIX VALVE	1	
33	EM517650	FLOW CONTROL MANIFOLD ASSY.	1	
		W/ PARKER P1-100 PUMP		INCLUDES ITEMS W/$
34	EM517032	HOSE, MAIN MANIFOLD	1	
35	EM25459	ELBOW	1	
36$	TBD	VALVE, MAIN RELIEF	1	
37	EM514608	HOSE	1	
39	EM25459	ELBOW	1	
40	EM25429	ELBOW ADAPTER	1	
41	54812	SCREW ALLEN HEAD CAP	10	REPLACES EM162
42	EM506611	BOLT	8	
43	EM517149	FITTING 90°	1	


FRONT OF MACHINE
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B1
T1
A2
B2
T3
P2
T2
AAC
P1
GA

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM963102	BOLT 1/2 X 1-1/4 IN.	4	REPLACES 492393
2	6109180	WASHER, LOCK 1/2 IN.	4	REPLACES 492626
3	EM98261	MANIFOLD ASSY COMPLETE	1	REPLACES EM98109
				INCLUDES ITEMS W/ %
4%	EM98220	CYCLING VALVE, SWING W/PILOTS	1	INCLUDES ITEMS W/ #
5%#	EMBK227	BOLT, SHCS 1/2" x 2-1/4"	12	
6%#	EM98223	PILOT VALVE, SHUTTLE	1	
7%#	EMBK2097	BOLT, SHCS 1/2" X 1-1/4"	8	
8%	EM98221	CYCLING VALVE, MAIN	1	INCLUDES ITEM W/ &
9%&	EM98222	PILOT VALVE, MAIN CYLINDER	1	
10%	EM98227	CHECK VALVE	1	
11%	EM98224	MAIN RELIEF VALVE	1	DISCONTINUED MAY 2007
12%	EM98228	COIL, 12VDC ACCUMULATOR	1	
12A%	EM98229	ACCUMULATOR UNLOADER CARTRIDGE ASSY	1	
13	EM25498	ADAPTER	1	
14	EM509401	ADAPTER	3	
15	EM514488	ADAPTER	1	
16	EM25459	ADAPTER	2	
17	EM98226	UNLOADING RELIEF VALVE, SHUTTLE	1	
18	EM514231	ADAPTER	2	
19	EM14489	ADAPTER	3	MAY 2007 AND BELOW
19	EM514489	ADAPTER	2	JUNE 2007 AND ABOVE
20	EM509796	ADAPTER	1	
21	506193	ADAPTER	1	
22	EM25462	ADAPTER	2	
23	EM509353	ADAPTER	3	
24	EM25429	ADAPTER	1	
25	TBD	CHECK VALVE	1	

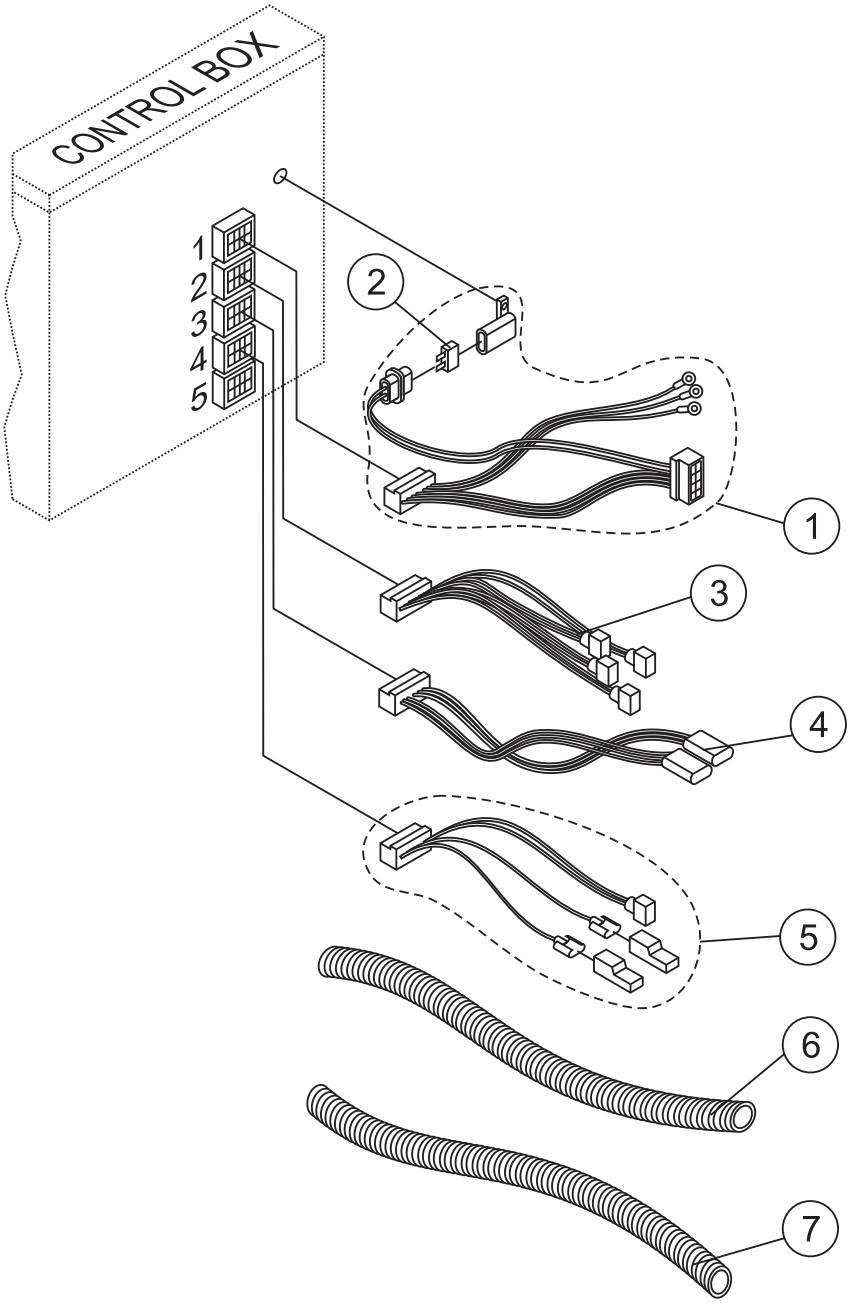
CONTROL BOX ASSY.



CONTROL BOX ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1		CONTROL BOX ASSY	1	CONTACT FACTORY
2	0202	BOLT 5/16 X 1 IN.	4	REPLACES 492364
3	EM923023	WASHER, FLAT 5/16 IN.	4	REPLACES 492597
4	2105164	NUT 5/16 IN.	4	REPLACES 492582
5	TBD	OVERLAY, CONTROL PANEL	1	
6	EM98206	IGNITION SWITCH ASSY.	1	
7	EM98206K	KEY, IGNITION	1	
8	EM517177	EMERGENCY STOP SWITCH ASSY.	1	
8A	EM517186	CONTACT BLOCKS, EMERGENCY SWITCH	3	
12	EM98120	FLOW DIRECTION SWITCH ASSY.	1	
13	EM98119	MAIN CONTROL SWITCH ASSY.	1	
14	EM98121	AUTO/JOG SWITCH ASSY.	1	
15	EM98122	JOG A/B SWITCH ASSY.	1	
18	EM97068	RECEPTACLE, REMOTE	1	
19	TBD	VOLUME SWITCH ASSY.	1	
20	TBD	SCROLL SWITCH ASSY.	1	
21	TBD	RESET SWITCH ASSY.	1	

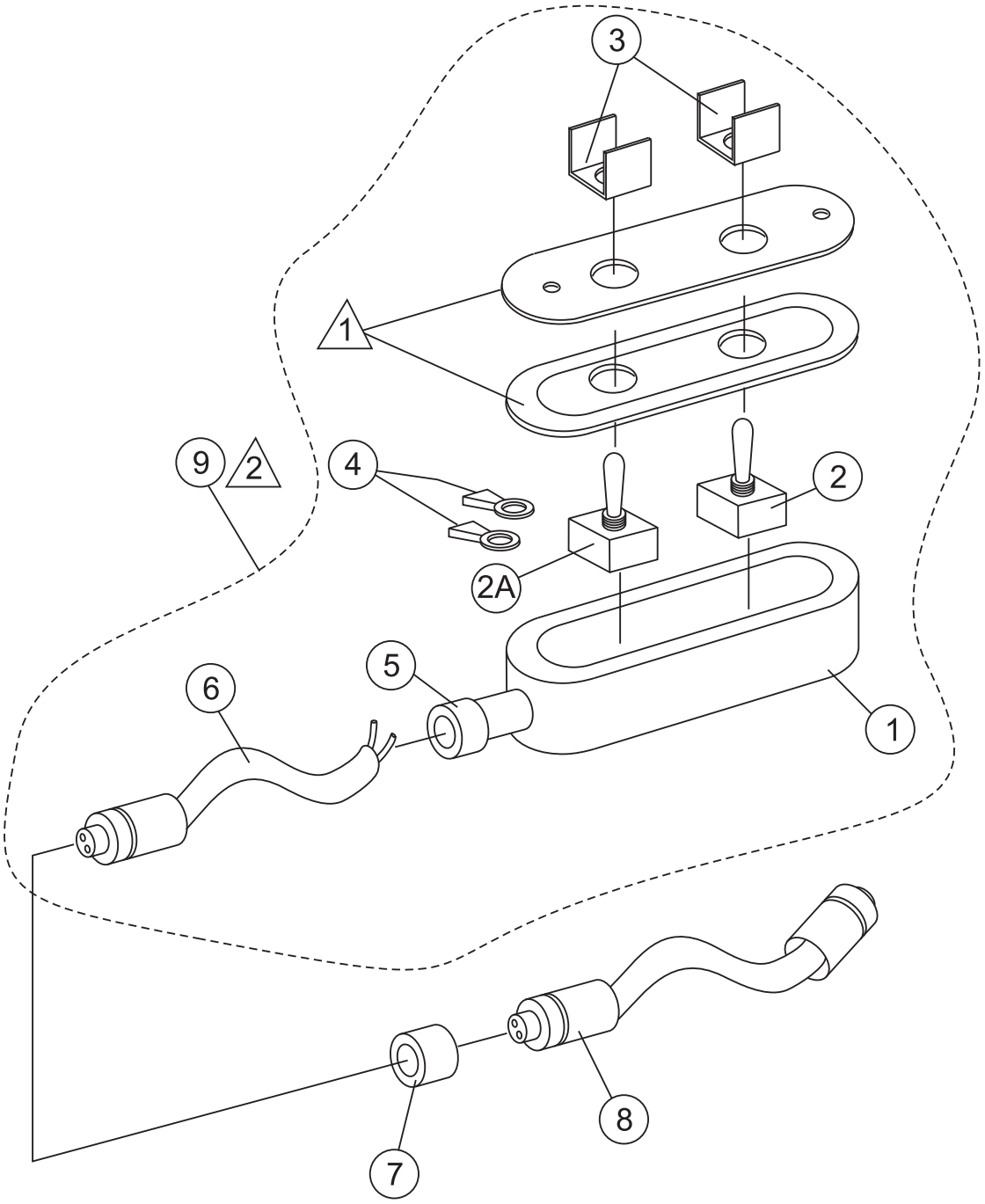
CONTROL BOX HARNESSES ASSY.



CONTROL BOX HARNESSES ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	EM517931	WIRE HARNESS 1 & 2	1	
2	344102000	FUSE, 30 AMP	1	
3	EM514636	WIRE HARNESS 2	1	
4	EM517932	WIRE HARNESS 3	1	
5	EM517934	WIRE HARNESS 4	1	
6	509588	POLY FLEX TUBE 1/2 IN. BLACK	AR	
7	16716	CONDUCTIVE DIVIDER 3/8 IN.	AR	

REMOTE CONTROL CABLE ASSY.



NOTES:

1 INCLUDED WITH ITEM 1.

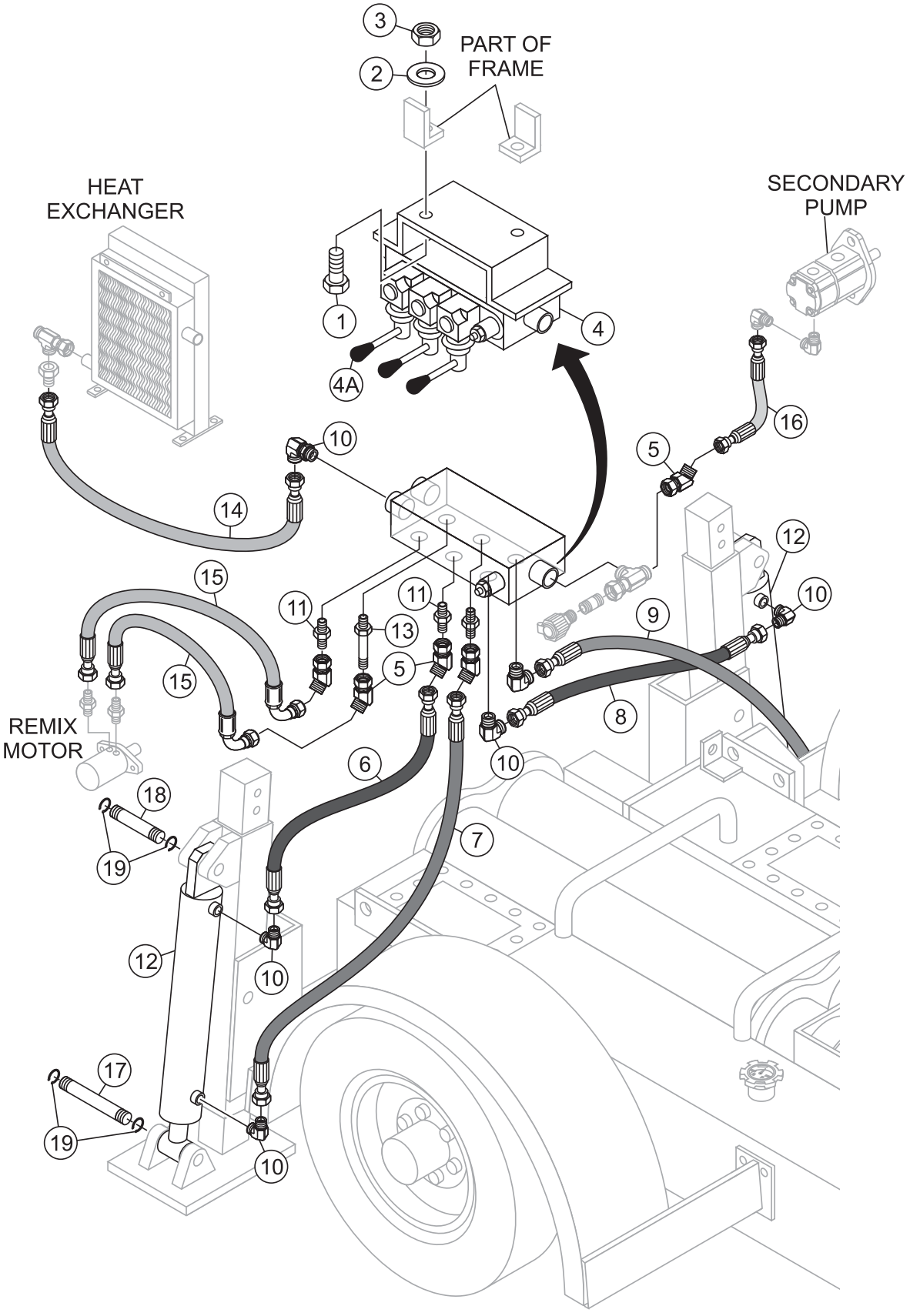
2 COMPLETE CORD ASSY. INCLUDES ITEMS WITHIN DASHED LINE.

LS600 PUMP — REMOTE CONTROL CABLE ASSY.

REMOTE CONTROL CABLE ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1*	EM16753	JUNCTION BOX	1	
2*	EM16754	SWITCH	1	
2A	EM97075	SWITCH	1	
3*	EM491897	CONNECTOR, RING 3/16 IN.	4	
4*	EM16756	GUARD SWITCH - ALUMINUM	2	
5*	EM26791	SEAL, GRIP CORD	1	
6*	EM26790	CORD, MX P/E 25 FT.	1	
7	EM26793	ADAPTER, CORD GRIP 1/2 IN.	1	
8	EM97065	ADAPTER, CORD 100 FT.	1	
9	EM97099	COMPLETE CORD ASSY 25 FT	1	INCLUDES ITEMS W/*

LS600 PUMP — HYDRAULIC STABILIZER ASSY. (OPTIONAL)



LS600 PUMP — HYDRAULIC STABILIZER ASSY. (OPTIONAL)

OPTIONAL HYDRAULIC STABILIZER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	TBD	BOLT	2	
2	TBD	WASHER	2	
3	TBD	NUT	2	
4	EM98046	VALVE REMIXER W/ 3 LEVERS	1	
4A	EM98047	HANDLE, DIRECTIONAL VALVE	3	
5	506200	FITTING 45°	5	
6	517101	HOSE	1	
7	517102	HOSE	1	
8	517103	HOSE	1	
9	517104	HOSE	1	
10	512655	FITTING 90°	7	
11	25509	FITTING STRAIGHT	3	
12	EM516382	HYDRAULIC STABILIZER	2	
13	517107	FITTING STRAIGHT	1	
14	517105	HOSE	1	
15	517100	HOSE	2	
16	517106	HOSE	1	
17	517153	BOLT	2	
18	517154	BOLT	2	
19	490957	SNAP RING	8	

TERMS AND CONDITIONS OF SALE — PARTS

PAYMENT TERMS

Terms of payment for parts are net 30 days.

FREIGHT POLICY

All parts orders will be shipped collect or prepaid with the charges added to the invoice. All shipments are F.O.B. point of origin. Multiquip's responsibility ceases when a signed manifest has been obtained from the carrier, and any claim for shortage or damage must be settled between the consignee and the carrier.

MINIMUM ORDER

The minimum charge for orders from Multiquip is $15.00 net. Customers will be asked for instructions regarding handling of orders not meeting this requirement.

RETURNED GOODS POLICY

Return shipments will be accepted and credit will be allowed, subject to the following provisions:

1. A Returned Material Authorization must be approved by Multiquip prior to shipment.
2. To obtain a Return Material Authorization, a list must be provided to Multiquip Parts Sales that defines item numbers, quantities, and descriptions of the items to be returned.
 a. The parts numbers and descriptions must match the current parts price list.
 b. The list must be typed or computer generated.
 c. The list must state the reason(s) for the return.
 d. The list must reference the sales order(s) or invoice(s) under which the items were originally purchased.
 e. The list must include the name and phone number of the person requesting the RMA.
3. A copy of the Return Material Authorization must accompany the return shipment.
4. Freight is at the sender's expense. All parts must be returned freight prepaid to Multiquip's designated receiving point.
5. Parts must be in new and resalable condition, in the original Multiquip package (if any), and with Multiquip part numbers clearly marked.
6. The following items are not returnable:
 a. Obsolete parts. (If an item is in the price book and shows as being replaced by another item, it is obsolete.)
 b. Any parts with a limited shelf life (such as gaskets, seals, "O" rings, and other rubber parts) that were purchased more than six months prior to the return date.
 c. Any line item with an extended dealer net price of less than $5.00.
 d. Special order items.
 e. Electrical components.
 f. Paint, chemicals, and lubricants.
 g. Decals and paper products.
 h. Items purchased in kits.
7. The sender will be notified of any material received that is not acceptable.
8. Such material will be held for five working days from notification, pending instructions. If a reply is not received within five days, the material will be returned to the sender at his expense.
9. Credit on returned parts will be issued at dealer net price at time of the original purchase, less a 15% restocking charge.
10. In cases where an item is accepted, for which the original purchase document can not be determined, the price will be based on the list price that was effective twelve months prior to the RMA date.
11. Credit issued will be applied to future purchases only.

PRICING AND REBATES

Prices are subject to change without prior notice. Price changes are effective on a specific date and all orders received on or after that date will be billed at the revised price. Rebates for price declines and added charges for price increases will not be made for stock on hand at the time of any price change.

Multiquip reserves the right to quote and sell direct to Government agencies, and to Original Equipment Manufacturer accounts who use our products as integral parts of their own products.

SPECIAL EXPEDITING SERVICE

A $35.00 surcharge will be added to the invoice for special handling including bus shipments, insured parcel post or in cases where Multiquip must personally deliver the parts to the carrier.

LIMITATIONS OF SELLER'S LIABILITY

Multiquip shall not be liable hereunder for damages in excess of the purchase price of the item with respect to which damages are claimed, and in no event shall Multiquip be liable for loss of profit or good will or for any other special, consequential or incidental damages.

LIMITATION OF WARRANTIES

No warranties, express or implied, are made in connection with the sale of parts or trade accessories nor as to any engine not manufactured by Multiquip. Such warranties made in connection with the sale of new, complete units are made exclusively by a statement of warranty packaged with such units, and Multiquip neither assumes nor authorizes any person to assume for it any other obligation or liability whatever in connection with the sale of its products. Apart from such written statement of warranty, there are no warranties, express, implied or statutory, which extend beyond the description of the products on the face hereof.

Effective: February 22, 2006

MECHANICAL DRIVE MODELS

MAYCO PUMP, hereinafter referred to as “Manufacturer’, warrants each new Mayco Pump sold by the manufacturer to be free from defects in material and workmanship, under normal use and service, for a period of one year after the date of delivery to the original retail purchaser. Manufacturer will, at its option, replace or repair at a point designated by the Manufacturer any part or parts which shall appear to the satisfaction of the Manufacturer upon inspection at such point to have been defective in material or workmanship. This warranty does not obligate the Manufacturer to bear any transportation charges or labor charges in connection with the replacement or repair the of the defective parts.

This warranty does not apply to any pump if attempts have been made to pump concrete materials which have separated, to any pump which has been repaired with other than Genuine Mayco Parts, nor to any pump which has been altered, repaired or used in such manner as to adversely affect its performance, nor to normal service or maintenance or where blockages have developed within the pump manifold or placing line or which has been operated in any other manner not recommended by the Manufacturer. Due to the abrasive nature of concrete, Mayco does not cover natural component wear.

THIS WARRANTY AND MANUFACTURER’S OBLIGATION HEREUNDER, IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY AND ALL OTHER OBLIGATIONS OR LIABILITIES INCLUDING SPECIAL OR CONSEQUENTIAL DAMAGES OR CONTINGENT LIABILITIES ARISING OUT OF THE FAILURE OF ANY PUMP OR PART TO OPERATE PROPERLY, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

HYDRAULIC DRIVE MODELS

MAYCO PUMP, hereinafter referred to as “Manufacturer”, warrants each new Mayco Pump sold by the manufacturer to be free from defects in material and workmanship, under normal use and service, for a period of one year or 2000 hours after the date of delivery to the original retail purchaser. The Manufacturer will, at its option, replace or repair at a point designated by Manufacturer any part or parts which shall appear to the satisfaction of Manufacturer upon inspection at such point to have been defective in material or workmanship. This warranty does not obligate Manufacturer to bear any transportation charges or labor charges in connection with the replacement or repair of the defective parts.

This warranty does not apply to any pump if attempts have been made to pump concrete materials which have separated, to any pump which has been repaired with other than Genuine Mayco Parts, nor to any pump which has been altered, repaired or used in such manner as to adversely affect it’s performance, nor to normal service or maintenance or where blockages have developed within the pump manifold or placing line or which has been operated in any other manner not recommended by the Manufacturer. Due to the abrasive nature of concrete, Mayco does not cover natural component wear.

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OPERATION AND PARTS MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON-HAND WHEN CALLING

UNITED STATES

Multiquip Corporate Office

18910 Wilmington Ave.
Carson, CA 90746
Contact: mq@multiquip.com

Tel. (800) 421-1244
Fax (800) 537-3927

MQ Parts Department

800-427-1244
310-537-3700

Fax: 800-672-7877
Fax: 310-637-3284

Service Department

800-421-1244
310-537-3700

Fax: 310-537-4259

Warranty Department

800-421-1244
310-537-3700

Fax: 310-943-2249

Technical Assistance

800-478-1244

Fax: 310-943-2238

MEXICO

MQ Cipsa

Carr. Fed. Mexico-Puebla KM 126.5
Momoxpan, Cholula, Puebla 72760 Mexico
Contact: pmastretta@cipsa.com.mx

Tel: (52) 222-225-9900
Fax: (52) 222-285-0420

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Dukinfield, Cheshire SK16 4UJ
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Multiquip

4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
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Tel: (450) 625-2244
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This manual MUST accompany the equipment at all times. This manual is considered a permanent part of the equipment and should remain with the unit if resold.

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